# ELECTRICAL WEST

APRIL 1961

A McGRAW-HILL PUBLICATION

The Market for Luminous Ceilings

50 Cents

# This modern automobile and this Kuhlman transformer have one thing in common... *they both have the same finish!*

DuPont *"LUCITE"* Acrylic Lacquer, the same weather-resistant, performance-proven finish used on modern automobiles for the last several years, is now offered on Kuhlman pole-type transformers.

Millions of modern-day automobiles and extensive Kuhlman laboratory tests prove *LUCITE* finish stays brighter—weathers and chalks less than ordinary paints. Its acrylic content, as opposed to alkyd types, keeps the finish beautiful and bright for a much longer period of time.

**4 Step Transformer Protection**

Drawing on the success of the automotive industry, DuPont and Kuhlman engineers developed a 4-step process to assure the same results for transformers: (1) First, all surfaces are thoroughly cleaned; (2) Then, a primer is applied to prevent corrosion; (3) Next comes a sealer to assure adhesion and prevent chipping or peeling; (4) Finally, a coat of high-luster, weather-resistant *LUCITE* Acrylic Lacquer, with the lowest erosion rate of any finish available today.

What *LUCITE* has done for automobiles, it will now do for your transformers. Get this wonderful, new finish at no extra cost on your Kuhlman transformers this year.

## KUHLMAN TRANSFORMERS

**KUHLMAN ELECTRIC COMPANY, Birmingham, Michigan**

***Manufacturers of transformers since 1894***

**Western Division—Salinas, California**

# How We Live

*Throughout the course of recorded history, man has exhibited one common and unchanging trait—he always wanted more than he had*

Previously in this series, we pointed out that the American way of life was based on the freedom of individuals to exercise their energies and initiative and to retain for themselves the benefits of these highly personalized activities. Strangely enough, here we have a system that is designed to benefit each of us. Yet we are also given the responsibility of controlling and directing its operation. To do this intelligently, we ought to know something about how the system functions.

In order to exist, man must work. Primitive man worked in order to get food, shelter and to provide himself with protection from predatory enemies, other men included.

Throughout the course of recorded history, man has exhibited one common and unchanging trait—he always wanted more than he had. However, until the early 19th century nature and society conspired against him. Primitive man had few tools and generally limited resources, which prevented him from ever getting much more than the bare essentials for survival. In later societies, man was merely a production unit for his overlords who seized much of his production for their own purposes.

**Then came the revolutions. The American revolution freed man to enjoy the full benefits of his labors. The industrial revolution substituted mechanical power for manual labor and multiplied a hundred-fold the amount of work each man could do. In America this combination set the stage for an entirely new kind of civilization.**

The frontier family in Revolutionary times was a practically self-sufficient unit. It grew its own food, built its own shelter, wove its own clothes, tanned its own hides and even prescribed its own medicine from readily available herbs and other vegetation. Under their newly founded freedom, people soon found out that there were advantages to specialization.

For example, one family with a good stand of timber on its land found that it could cut more lumber than it needed and could sell it profitably to families that didn't have any. Others decided that it would be a good idea to build barge canals and railroads to bring grain to a new power-driven milling operation, hides to a tannery located near a city where there would be a good market for shoes, or lumber sawed in the hills to supply the housing needs of growing communities. Thus, the evolution from the self-sufficient family unit to highly specialized producing organizations began.

Today hardly anybody is really self-sufficient. Almost all of us are wholly dependent upon the smooth functioning of a vast productive and distribution organization. Most of us are specialists, contributing only a small fraction of the over-all effort involved in producing a vast output of goods and services. Most of us work for big organizations that enable this production to be done efficiently. Most of us rely fully on that weekly pay check with which we can buy the essentials and as many of the luxuries of life as it permits.

Thus in the course of a hundred years we have changed from a nation of self-sufficient individuals to a people who are almost fully dependent upon the "system." Our jobs, therefore, become of primary importance in relationship to the security of ourselves and our families. Anything and everything that affects our job is of critical importance to us. In the same way, anything and everything that affects the companies or organizations that provide those jobs also should be of vital interest to us.

Because jobs do represent security, knowledge of how they are affected by the various forces at play in a modern, industrial society is essential. In subsequent discussions we will try to analyze how these various forces such as competition, inflation, taxation, regulation, research, and legislation affect you, your job, and the organization that makes your job possible.

**Rides fine if you steer well**

## Advisory Board

**Pacific Southwest Region**

J. F. Davenport, Executive Vice-President
Southern California Edison Co., Los Angeles

R. H. Cockfield, General Sales Manager
Department of Water & Power, Los Angeles

Joseph Pengilly, Vice-President
Square D Co., Los Angeles

Leonard Hobbs, Vice-President
Smoot-Holman Co., Inglewood

H. C. Gerster, Manager, Western Zone
General Electric Supply Co., Los Angeles

Sidney Hill
Hill Electric Co., Los Angeles

C. M. Smith, Sales Manager
Fluor Corp., Los Angeles

Victor Hartley, Managing Director
PCEA, Los Angeles

**Northern California Region**

Walter Maytham, Vice-President
Westinghouse Electric Corp., San Francisco

Norman R. Sutherland, President
Pacific Gas & Electric Co., San Francisco

Fred Nicholas
F. M. Nicholas Co., San Francisco

Alfred H. Meyer, President
A. H. Meyer Co., San Francisco

Paul Churchill, Regional Manager
Line Material Industries, South San Francisco

George Abbett, President
Abbett Electric Co., San Francisco

Karl Bausch, Chief Electrical Engineer
Bechtel Corp., San Francisco

Walter Bayha
Bayha, Weir & Finato, San Francisco

**Intermountain Region**

R. D. Moody, Manager
Allis-Chalmers Mfg. Co., Denver

David B. Hyer Jr., President
Southern Colorado Power Co., Pueblo

D. E. Provost
Stearns Roger Mfg. Co., Denver

Ralph Johnson, Vice-President & General Manager, Sturgeon Electric Co., Denver

Ken G. Eaton, District Manager
Anaconda Wire & Cable Co., Denver

Howard Peterson
Peterson Co., Denver

W. W. Bowman, Director of Publicity
Utah Power & Light Co., Salt Lake City

A. E. Fleming, District Manager
General Electric Supply Co., Denver

**Pacific Northwest Region**

Eric Nelson
Shaffer & Nelson, Seattle

Ralph James
Northwestern Agencies, Seattle

R. B. Lane, President
Industrial Electric Co., Seattle

Beverly Travis, Consulting Engineer
Seattle

Eugene Starr, Chief Engineer
Bonneville Power Administration, Portland

Thomas W. Delzell, Chairman of Board
Portland General Electric Co., Portland

D. R. McClung, President
Pacific Power & Light Co., Portland

James F. Grieve, Vice-President
C. C. Moore, Engineers, Portland

Max Wood
Schwager-Wood Co., Portland

R. H. Sroufe, Executive Vice-President
Stubbs Electric Co., Portland

Alden F. Krieg, Managing Director
NELPA, Portland

Jack D. Stevens
Puget Sound Utilities Council, Seattle



# ELECTRICAL WEST

SPOKESMAN FOR THE MOST HIGHLY ELECTRIFIED REGION OF THE U. S.



C. W. Leihy, Publisher
Jack Robinson, Editor
Peggy Boyer, Associate Editor
Miriam Stuart, Editorial Assistant
Douglas Greenwald, Economics Consultant
Burkey Musselman, Washington News

George C. Tenney, President
W. A. Cyr, Consulting Editor
Hugh James, Engineering Editor
Roy Bloomberg, Pacific Northwest Region
Marvin Petal, Pacific Southwest Region
Frank Pitman, Intermountain Region


## CONTENTS


VOL. 126, NO. 4 APRIL 1961



Higher Distribution Voltages by H. V. Strandberg and L. L. Gleason ..... 71

34.5 Kv in a Large City by Carl F. Brengartner ..... 72

News From Idaho by Don E. Haasch ..... 75

Western Underground Committee ..... 76

Clean Lines ..... 77

Portland Memorial Coliseum Can Take It ..... 78

A Luminous Solution ..... 86

New Plant Electrical System by R. A. Weimer and F. K. Fox ..... 86

When Motors 'Single Phase' by Tom Hughes ..... 92


Cover: Wen Garrett, Republic Electric Co. of San Francisco, in Joseph Magnin's second floor dress shop, where he solved a lighting problem (see story, p 86). Photo by George Waters.

### DEPARTMENTS


Contracting and Construction ..... 85

Editorials ..... 1, 31, 70

Letters to the Editor ..... 6

Meetings Calendar ..... 11

News ..... 37

Product Information Service ..... 100

Product News ..... 102

Advertising Index ..... 115



**ADVERTISING REPRESENTATIVES**

**ATLANTA 9: R. K. Burnet, 1375 Peachtree St., N. E., TR 5-0523; CHICAGO 11: W. C. McMurray Jr., 520 N. Michigan Ave., MO 4-5800; DALLAS 1: Frank LeBeau, 901 Vaughn Bldg., RI 7-9721; DENVER 2: John Patten, 1700 Broadway, AL 5-2981; DETROIT 26: Peter Hammond, 856 Penobscot Bldg., WO 2-1793; HOUSTON 25: Gene Holland, W-724 Prudential Bldg., JA 6-1281; LOS ANGELES 17: Bob McGinnis, 1125 W. Sixth St., HU 2-5450; NEW YORK 36: Francis X. Roberts, Nelson L. Bond Jr. (New England), 500 Fifth Ave., OX 5-5959; PITTSBURGH 22: Don Farris, 4 Gateway Center, EX 1-1314; PORTLAND 4: Scott Hubbard, 445 Pacific Bldg., CA 3-5118; SAN FRANCISCO 11: T. H. Carmody, Advertising Sales Manager, Peter B. Eben, Dick Alcorn, Bernice Johnston, Advertising Production Manager, 255 California St., DO 2-4600.**

Offices: Boston, Cincinnati, Cleveland, Philadelphia, St. Louis, Tulsa



**Electrical West** (with which is consolidated The Journal of Electricity), April 1961, Vol. 126, No. 4. Published semimonthly except November when published trimonthly by McGraw-Hill Company of California, James H. McGraw (1860-1948) Founder. Office of publication, 235 N.W. Park Ave. Portland 9, Ore. See panel below for directions regarding subscriptions or change of address.

**Executive, editorial, circulation and advertising offices:** 255 California St., San Francisco 11, Calif. Donald C. McGraw, chairman of the board; George C. Tenney, president; John W. Otterson, vice-president; Thomas H. Carmody, secretary and treasurer.

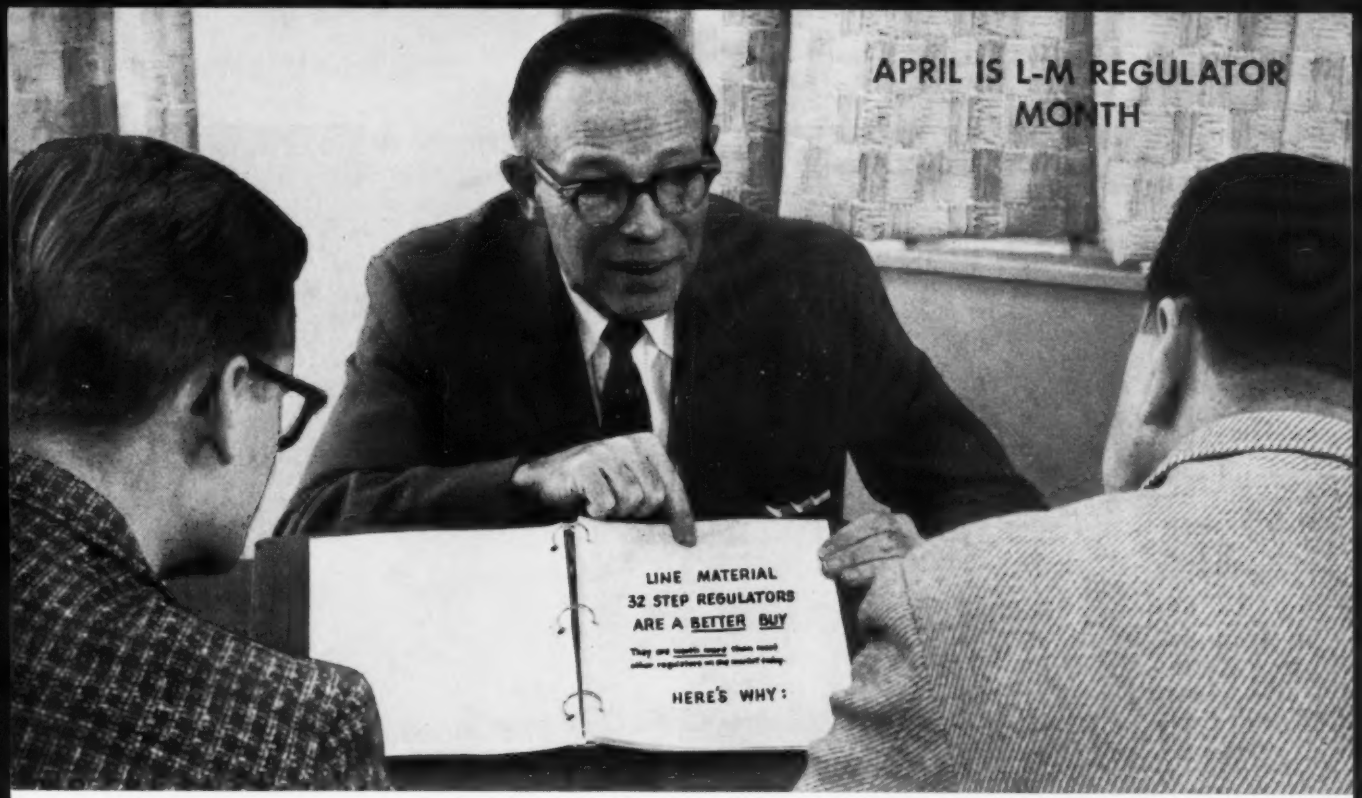
**Position and company connection must be indicated on subscription orders.** Send to address shown in panel below. Subscription price includes the regular monthly issue, the news letter issue and the November directory issue. United States subscription rate $3 a year, single copies 50c. (November directory issue $1); Latin American Republics and Philippine Islands $6 a year; Canada $4 a year; all other countries $10 a year. Entered as second class matter, Dec. 17, 1956, at the post office at Portland, Ore., under the act of March 3, 1879. Printed in U. S. A. Title registered in U. S. Patent Office.


© Copyright 1961, McGraw-Hill Company of California. All rights reserved.


**Unconditional Guarantee:** Our primary aim is to provide subscribers with a useful and valuable publication. Your comments and suggestions for improvement are encouraged and will be most welcome. The publisher, upon written request, agrees to refund the part of the subscription price applying to the remaining unfilled portion of the subscription if editorial service is unsatisfactory.

SUBSCRIPTIONS: Send subscription correspondence and change of address to Subscription Manager, Electrical West, 255 California St., San Francisco 11, Calif. Allow 30 days for change of address.

**Postmaster: please send notice 3579 to Electrical West, 255 California St., San Francisco 11, Calif.**




**A. R. Waehner,** Director of Transformer Product Sales, presents the story of L-M 32-step Regulators. Ask your L-M Field Engineer to show you why L-M Regulators are a better buy—how less weight permits cluster-mounting; how Round-Wound construction assures lower losses, higher short-circuit strength, how the design provides many other advantages in convenience, operation, reliability.

# Ask Your L-M Field Engineer WHY L-M Regulators Are A Better BUY

**Round-Wound® design provides better cooling, lighter weight for cluster-mounting, higher short-circuit strength. Voltage and band width adjustments are accurately made in minutes.**

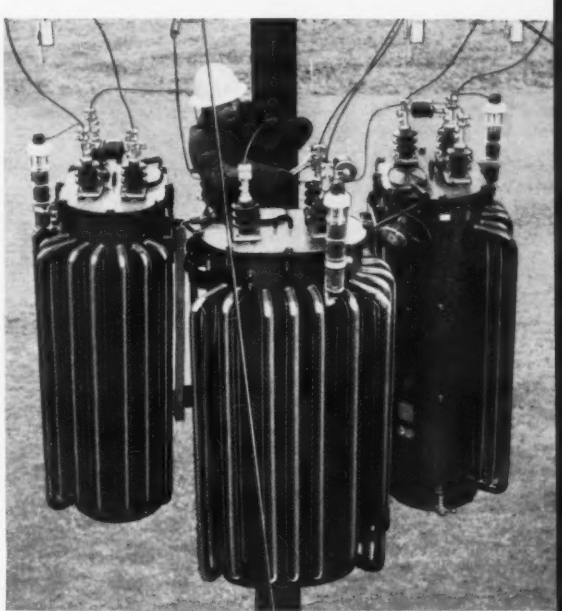
Only L-M's 32-step voltage regulators incorporate the Round-Wound principle of core-and-coil design. Round-Wound design provides faster heat transfer for better cooling.

**More Compact—77% Lighter**—Round-Wound core-and-coil assemblies are more compact. L-M regulators have shorter obround tanks requiring less oil. Up to 77% less weight permits cluster-mounting.

**Higher Short-Circuit Strength**—L-M's exclusive round coils withstand mechanical stresses of short-circuit currents better than other designs.

**Rugged, Reliable**—Only L-M regulators have the exclusive induction disc watt-hour type contact-making voltmeter. Control is more accurate, reliable and rugged. Calibration is easier with no interruption in service.

**Get The Whole Story**—Your L-M Field Engineer has the complete story on L-M's 32-step voltage regulators. Contact him today or write Line Material Industries, P.O. Box 510, Zanesville, Ohio.



**5000 KVA OF LOAD REGULATED FROM A SINGLE POLE!** Here three L-M 219 ampere, 7620 volt regulators are cluster-mounted to provide regulation on a 7620/13200 volt multi-grounded wye distribution feeder.

OUR 50TH YEAR 1911 – 1961

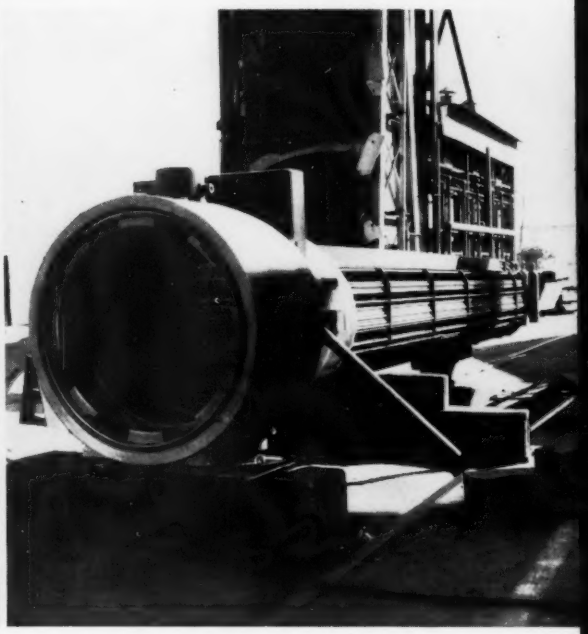
**LINE MATERIAL®**
**Industries**
McGRAW-EDISON COMPANY
Regulators

McGRAW EDISON

511

DISTRIBUTION TRANSFORMERS · RECLOSERS, SECTIONALIZERS AND OIL SWITCHES · FUSE CUTOUTS AND FUSE LINKS · LIGHTNING ARRESTERS · POWER SWITCHING EQUIPMENT
PACKAGED SUBSTATIONS · CAPACITORS · REGULATORS · OUTDOOR LIGHTING · LINE CONSTRUCTION MATERIALS · PORCELAIN INSULATORS · FIBRE PIPE & CONDUIT

Using special type gun, average operator can make completely tight tube weld in less than 15 seconds.



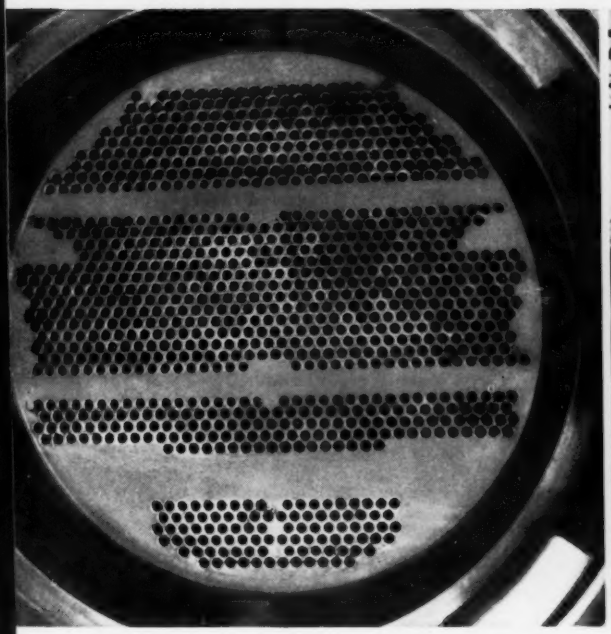
Head-on view of unit. Cufenloy-30 tubes are fabricated by special Phelps Dodge drawing and heat-treating process.

PHELPS DODGE
CUFENLOY-30

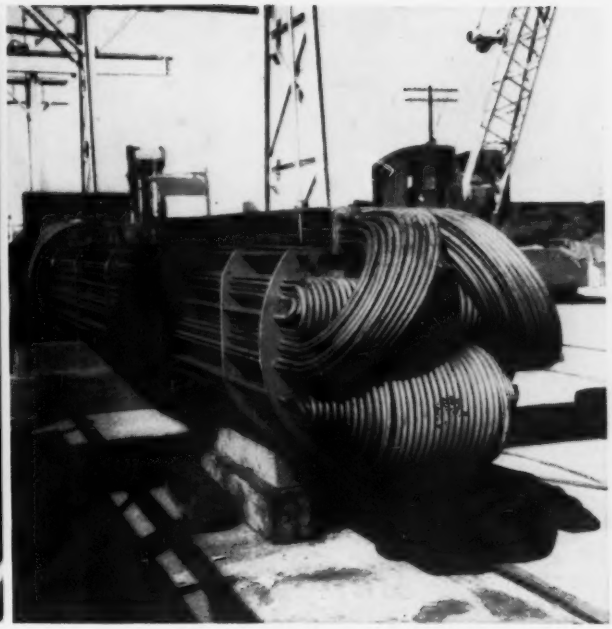
# DUAL GAUGE TUBES WELDED INTO FEEDWATER HEATERS

*U-bent units combine new high strength alloy tubes and new tube jointing technique for superior heat transfer efficiency and dependability*

*Photographs: Courtesy of Southwestern Engineering Co.*



Close-up of tube sheet shows welded-in tubes in place. Incomplete or unsound welds are easily corrected by re-welding.



Rear view of high pressure feedwater heater unit shows configuration of Cufenloy-30, U-bent Dual Gauge tubing.

Dual Gauge tubes of Cufenloy-30, the new and weldable, drawn, stress-relieved copper nickel alloy developed by Phelps Dodge, have been welded into high pressure feedwater heaters constructed by Southwestern Engineering Co. for a West Coast utility.

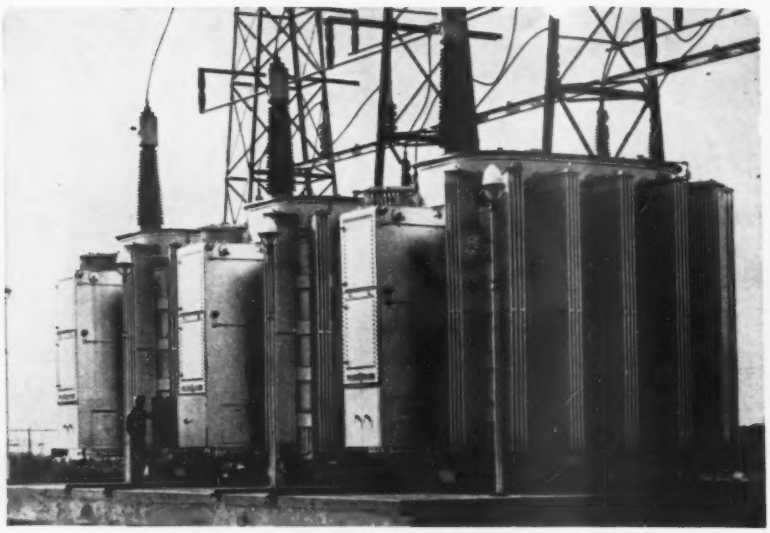
Cufenloy-30, containing nominally 70% copper and 30% nickel, is approved under the ASME Code, Case No. 1266, for unfired pressure vessels. This new alloy offers improved properties for OEM and retubing at a lower cost per bundle, yet without sacrifice of safety when substituted for 65/35 nickel copper alloy tubes. The Dual Gauge process provides a heavier wall thickness to compensate for thinning on outer portions of return bends.

Specially designed Phelps Dodge welding guns were used to weld these tubes to the tube sheets. This advanced method assures tighter tube joints with more positive, permanent protection against leakage. The guns are controlled by preset relays and timers that start, stop and regulate electrode motion, welding current and argon flow.

Whatever your tubing or re-tubing requirements, call on Phelps Dodge for highest quality products, research and technical advisory service—a complete program backed by more than 40 years of experience in the heat exchanger and condenser tube field.

PHELPS DODGE COPPER PRODUCTS
CORPORATION
300 Park Avenue, New York 22, N. Y.

P D



# FOUR PRINCIPLES FOR TRANSFORMER PAINTING

1. **Color.** There is a direct relationship between color and operating temperature. Subox paints are made in modern colors to meet *present-day peak load requirements.* They are available in standard grays, and also in decorator shades for color-styling in residential neighborhoods.

2. **Film Thickness.** When repeated coats of paint build up on a transformer they tend to act as a blanket and hold the heat in. With Subox paints, *fewer coats are needed* and internal heat is more efficiently dissipated.

3. **Film Structure.** Aluminum-containing paints are often desired because they reflect sunlight; however, in conventional paints of this type the aluminum flakes overlap and leaf together to form an insulating barrier. In our Subalox paints, the polished aluminum flakes are non-leafing and do not overlap. Therefore, they promote both reflection and better radiation.

4. **Long Life.** The paint on a transformer is subject to wide temperature changes. *All Subox paints contain suboxide of lead.* This unique pigment remains chemically active even after drying; builds a tough, fibrous film that maintains flexibility and does not crack, chip, peel or blister even under the most punishing conditions.

*Leading electric utility companies use Subox paints for transformers. Write for color card and literature.*

SUBOX PAINTS

Subox Inc.
Trade Mark

Main Office & Plant
18 Fairmount Park Hackensack, N. J.
SALES ENGINEERS IN MOST MAJOR CITIES
Affiliated Plants: Canada, Mexico, England, Belgium, Switzerland, Austria, Australia, New Zealand.

## LETTERS

To the Editor:

The unsigned editorial on page 1 of the January issue seems to portend a snow job. The basic economic principles 1 to 5 are not special, but apply to America *and* India, Ghana, Cuba, Germany, Japan, China, and everywhere. The system of 1776 was not a new economic system. Capital investment began with the first tool. The system of 1776 was a *social* system which placed everyman's idea on an equal footing with every other man's, whether investor or laborer, with equal right to be heard and evaluated by each man's fellows and their experience.

Carl Jung's statement erroneously implies there are other ways of stopping the spread of ideas without merit, in nonhumanitarian societies, than by critical reason of an intelligent and stable population. There is no other way. To believe that there is is error. Our heritage recognizes that. That is its singularity; not investment economics.

RUSS LINTON, Electrical Engineer
San Diego, Calif.

To the Editor:

Congratulations to your ELECTRICAL WEST editors on two features in the January issue—"This is America" and "You Must Become an Eclectic Utility." I liked them because they deal with the incentive system (usually called free enterprise) and give me an excuse to make a pitch on what I call Operation Businessmen Articulate. Here goes—

I think business should be more articulate, especially insofar as government and politics are concerned. I'd like to suggest that ELECTRICAL WEST and other McGraw-Hill books develop a program aimed at urging businessmen to:

A. Write their congressmen often and on every measure or matter of interest to them and their businesses.

B. Tell their employees how issues before Congress affect business and the pay envelope (especially take-home pay).

This urging can and should be done in both of two ways:

1. Through the editorial pages of business papers—and it should be a continuing program; not just a single-shot editorial.

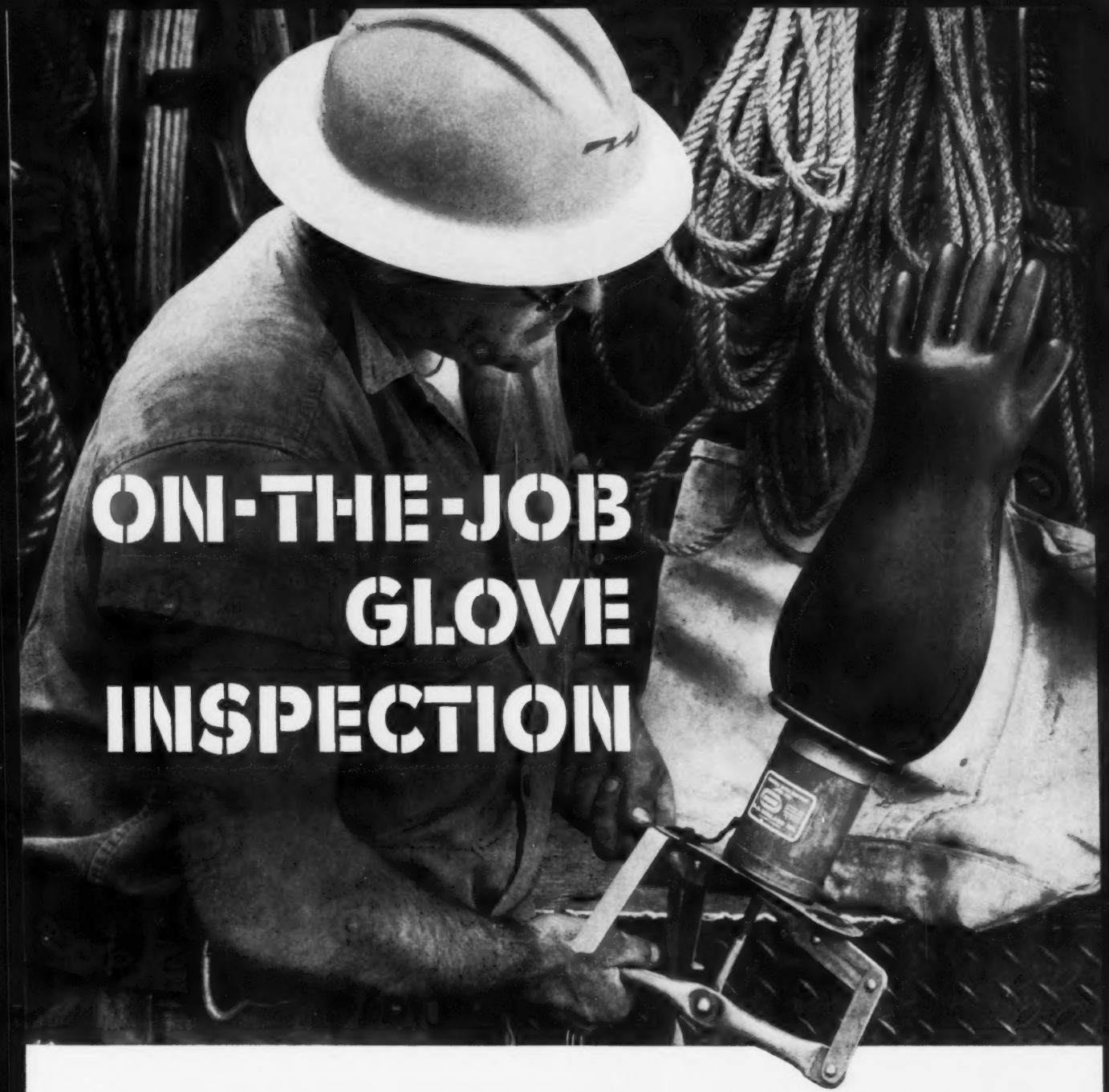
2. Through speeches by publishers and editors to association meetings and in face-to-face discussions.

Labor has its COPE. You can be sure it isn't helping business; but businessmen have done practically nothing to refute or challenge COPE. Now I'm not kidding myself that the ideas presented here constitute a business version of COPE, but I'm sure a steady flow of letters from individual businessmen, presenting their individual views to congressmen, can be powerful and effective. Urge businessmen not to put off presenting their views. If there isn't time for a letter, send clippings from newspapers or business papers with brief handwritten notes—I use the back of my business card...

As additional persuasion, I suggest your Washington bureau interview congressmen to get their views on letters and other ways of presenting the business viewpoint to Congress.

Industry has made this country strong and only by having a healthy business climate can we keep it strong. Furthermore, healthy business is vital to business papers. So it's logical that McGraw-Hill should advocate Operation Business Articulate.

GEORGE C. MCNUTT, Oakland, Calif.




## NEW/MATIC PORTABLE GLOVE TESTER

Test linemen's gloves immediately, efficiently, **anywhere** with the new Bullard lightweight NEW/MATIC Tester! So compact and economical that it can be standard equipment on every line truck.

Now—any time or any place—linemen can **daily double-check** the airtight safety of their gloves with just a few strokes of the pump. The Bullard NEW/MATIC Tester is available in two sizes: Catalog No. GT-A for glove size 9 with 14″, 16″ or 18″ gauntlet, and glove size 10 with 14″ or 16″ gauntlet; Catalog No. GT-B for glove size 10 with 18″ gauntlet, and glove size 11 with 14″, 16″ or 18″ gauntlet.

BULLARD
INDUSTRIAL SAFETY EQUIPMENT

*Call your Bullard Distributor today for full details and demonstration . . . or write*

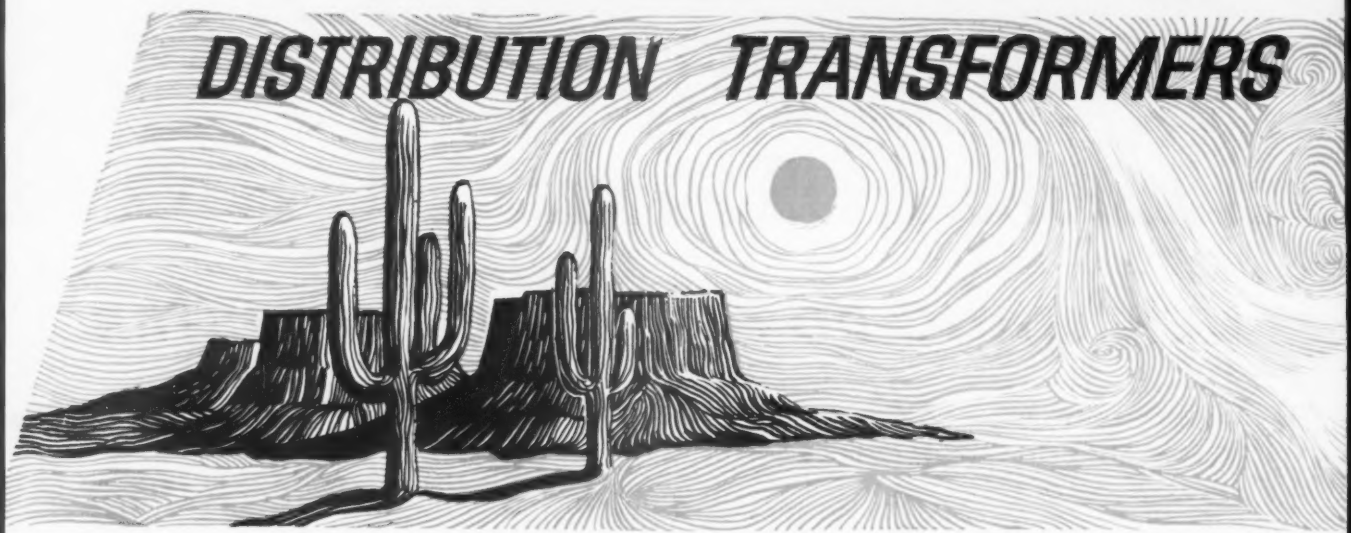
**E. D. BULLARD COMPANY**
SAUSALITO • CALIFORNIA
6719 SOUTH FIGUEROA, LOS ANGELES

***TEST GLOVES DAILY FOR CRACKS • TEARS • PUNCTURES***

COPYRIGHT 1961, E. D. BULLARD COMPANY

# ENDUR

## DISTRIBUTION TRANSFORMERS



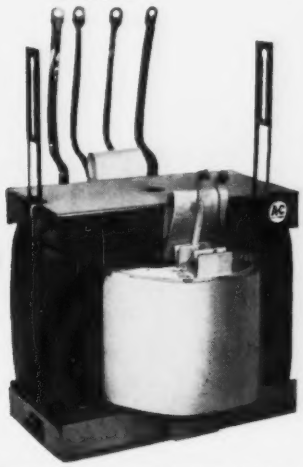
**ALLIS-CHALMERS**

A-1460

# New enduring values... more for your transformer dollar...yours with the all-new ENDUR-ALL line... guaranteed to perform far better than any previous design!

**ENDUR-ALL transformers** are available in conventional and self-protected types with such accessories as a low-voltage circuit breaker, high-voltage fuses and lightning arresters.

# ALL



**New locked core-and-coil construction** eliminates 32 nuts, bolts and washers from this assembly. Nothing to loosen, no welds to break. Locking straps assure uniform high compression for greater short-circuit strength.

## ENDURING VALUES IN OVERLOAD CAPABILITIES

new high-temperature oil . . . new high-temperature insulation . . . greater oil duct area in the coil.

## ENDURING VALUES IN INCREASED REVENUE

new design reduces impedance by as much as 25% — permits full utilization of the greater overload capacity.

## ENDURING VALUES IN SHORT-CIRCUIT STRENGTH

new *locked* core-and-coil construction assures uniform high pressure clamping of the coil for the life of the unit.

## ENDURING VALUES IN EASIER HANDLING

new ENDUR-ALL line is *10% lighter, 10% lower* for easier hanging.

## ENDURING VALUES IN REDUCED MAINTENANCE

new high-gloss-retention paint . . . nonaging, reusable gasketing... plus elimination of all nuts and bolts from end frame construction. No welds to break — nothing to loosen or shake free.

## . . . AND ALL THESE ENDUR-ALL DESIGN ADVANTAGES:

- 65 C rise with high overload capabilities
- Reduced maintenance with internally clamped bushings
- *Tuffilm* plastic-coated cover protects from animal and bird outages
- Series-multiple switch lowers changeover cost when making distribution voltage conversion. Write, phone or wire your nearby A-C office or Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

*Tuffilm* and *ENDUR-ALL* are Allis-Chalmers trademarks.

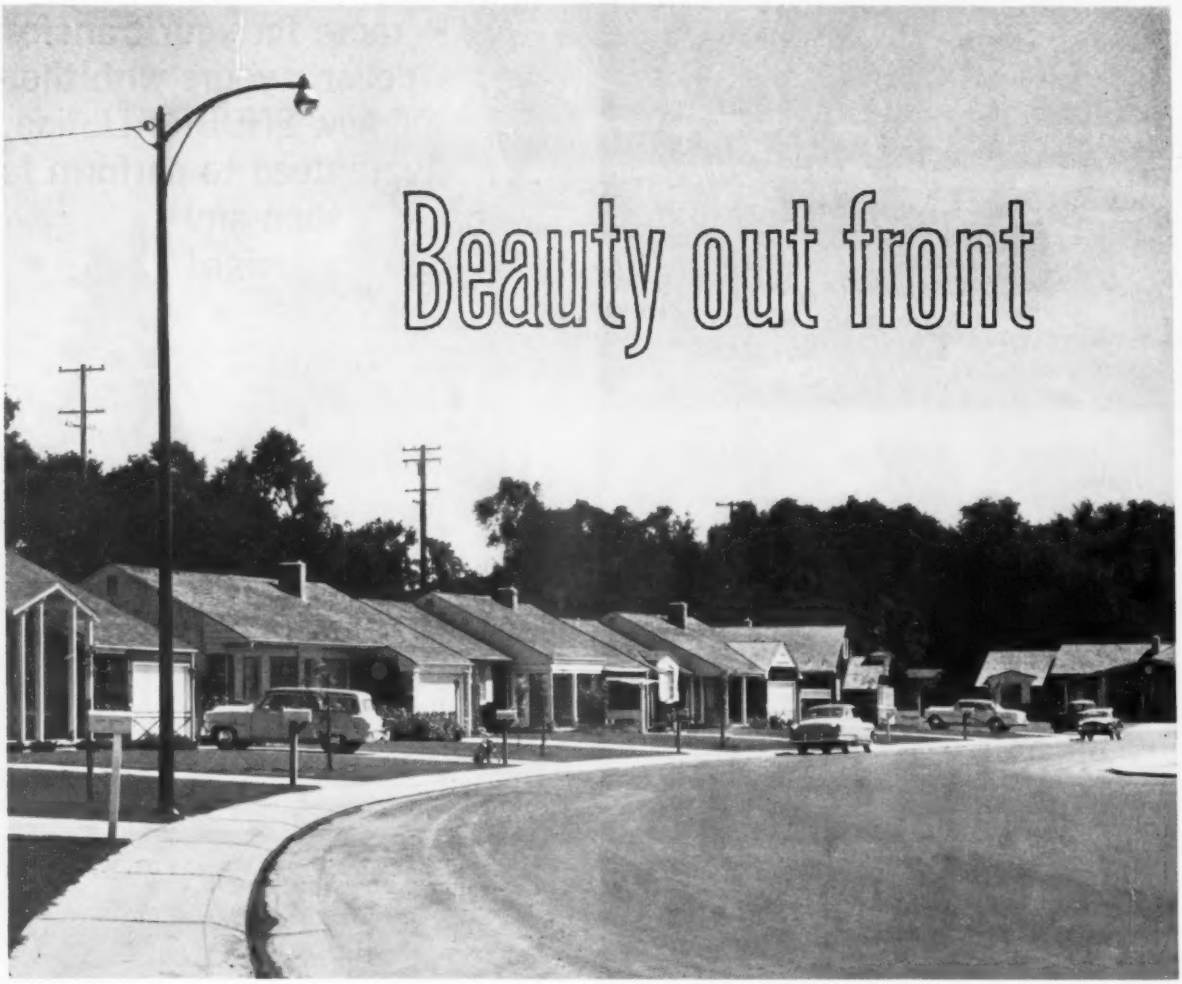



PHOTO A

PHOTO B

. . . is achieved in this pleasant Stockton, Calif., subdivision where Pacific Gas & Electric Company, by prior arrangement, placed utility poles at back of lot line, instead of at front. Unobtrusive wiring feeds graceful Weld-Rite lighting standards at street side (photo A). Thus, both curb area and skyline are uncluttered by wires running every-which-way (photo B).

This simple way, in new subdivisions, to improve neighborhood appearance and pride makes plenty of sense. Overhead wiring costs much less than underground installation, yet lines are largely out of sight.

Using tapered Weld-Rite standards, die-formed from full 10-gauge steel makes sense, too. They're strong, weather resistant, long-lasting. Poles meet EEI-NEMA specifications. Quick delivery from Western plant. Hundreds of Western installations. For fully illustrated, 24-page catalog, write or phone now.

10

**WELD-RITE COMPANY**

*Only active manufacturers of round tapered steel poles in the West.*

4417 Oakport St.
Oakland, Calif.
ANdover 1-3341

416 West 8th St.
Los Angeles, Calif.
MAdison 4-9338

*For phone number of closest representative see advertising index in back of book.*

## Meetings Calendar

**APRIL**

5-7—*Northwest Public Power Assn.*, annual meeting, Wenatchee, Wash.

5-7—*Radio Technical Commission for Marine Services*, spring convention, Sheraton-Palace Hotel, San Francisco, Calif.

6-9—*Electrical Maintenance Engineers Assn. of Northern California, Electrical Industry* Show, San Francisco.

6-7—*Pacific Coast Electrical Assn.*, Engineering & Operating Section, Ambassador Hotel, Los Angeles.

16-18—*Rocky Mountain Electrical League*, spring conference, Harvest House, Boulder, Colo.

17-18—*PCEA*, Business Development Section, Sheraton-Palace Hotel, San Francisco.

26-28—*Northwest Electric Light & Power Assn.*, Engineering & Operation Section, Personnel & Safety Section, Purchasing & Stores Committee, Sheraton-Portland Hotel, Portland.

26-29—*National Electrical Contractors Assn.*, Tri-District meeting, Hotel Fairmont, San Francisco.

27-28—*PCEA, Administrative Services* Section, spring conference, Villa Hotel, San Mateo, Calif.

28-29—*American Power Dispatchers Assn.*, national spring meeting, Phoenix, Ariz.

28-May 3—*San Diego Bureau of Home Appliances*, Electric Bldg., Balboa Park, San Diego.

**MAY**

1-2—*Illuminating Engineering Society*, Intermountain Region Conference, Hotel Utah, Salt Lake City.

2-4—*AIEE, IRE, WEMA, EIA* sponsored Electronic Components Conference, Jack Tar Hotel, San Francisco.

3-5—*IES*, South Pacific Coast Region conference, Sacramento Inn, Sacramento.

8-9—*IES*, Pacific Northwest Region conference, Harrison Hot Springs, Harrison, B. C.

17-19—*Pacific Coast Electrical Assn.*, annual conference, Sheraton-Palace Hotel, San Francisco.

20—*International Association of Electrical Inspectors*, three-chapter joint meeting; Northern and Central California, Sacramento Valley, Fresno, Calif.

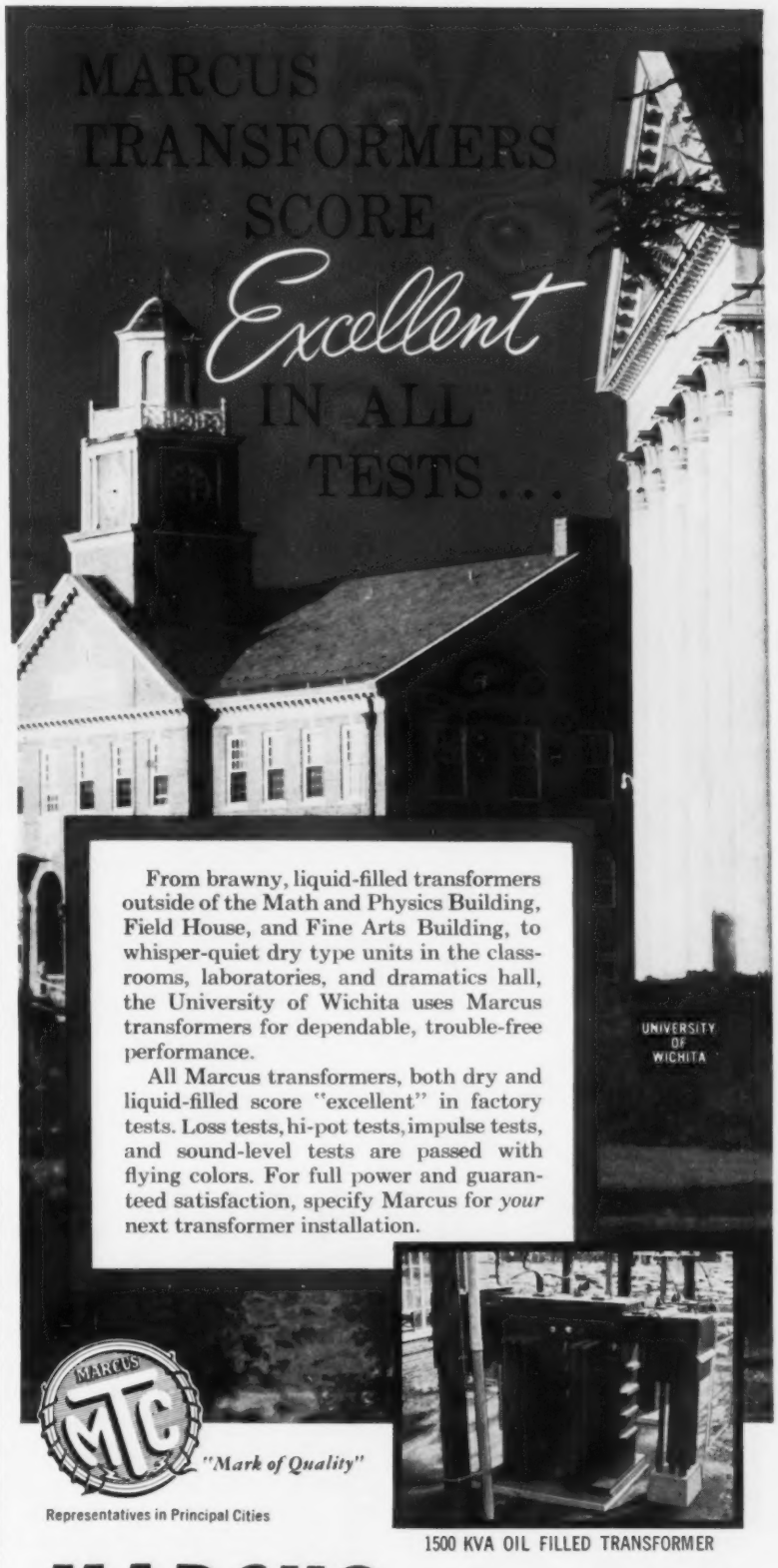
24-26—*Northwest Electric Light & Power Assn.*, Accounting & Business Practice Section, Medford Country Club, Medford, Ore.

**JUNE**

1-3—*Tri-State Electric Cooperative*, Oregon, Washington and Idaho, annual meeting, Shore Lodge, McCall, Idaho.

1-11—*Construction Industry Exposition & Home Show*, 16th annual home show, Los Angeles Memorial Sports Arena, Los Angeles.

8-9—*National Electrical Manufacturers Assn.*, Western conference, Biltmore Hotel, Los Angeles.


From brawny, liquid-filled transformers outside of the Math and Physics Building, Field House, and Fine Arts Building, to whisper-quiet dry type units in the classrooms, laboratories, and dramatics hall, the University of Wichita uses Marcus transformers for dependable, trouble-free performance.

All Marcus transformers, both dry and liquid-filled score "excellent" in factory tests. Loss tests, hi-pot tests, impulse tests, and sound-level tests are passed with flying colors. For full power and guaranteed satisfaction, specify Marcus for *your* next transformer installation.



1500 KVA OIL FILLED TRANSFORMER

MARCUS MTC "Mark of Quality"

Representatives in Principal Cities

**MARCUS TRANSFORMER CO., Inc.**

**RAHWAY, NEW JERSEY**

A COMPLETE LINE OF DRY TYPE AND LIQUID-FILLED TRANSFORMERS THRU 5000 KVA

# VERSATILE

## REYNOLDS 5005

### high strength, all-aluminum conductor

Reynolds 5005 aluminum alloy conductor is ideal for many overhead cable applications. It is excellent as the neutral messenger in triplex, provides low cost installations on distribution lines, and is adaptable for many high voltage lines. In addition, it is especially attractive for reconductoring, and can be used in special cable constructions. Reynolds 5005 is light in weight—stringing and handling costs are reduced. Since there is no steel core, splicing is easier, and there is no possibility of galvanic corrosion. Minimum guaranteed conductivity 53.5%. Complete data available from your nearest Reynolds branch office, Reynolds Electrical Distributor, or *Reynolds Metals Company, P.O. Box 2346-EK, Richmond 18, Virginia.*

Watch Reynolds TV show "Harrigan & Son", Fridays; also "All Star Golf", Saturdays—ABC-TV

*For phone number of closest representative see advertising index in back of book.*

# ALLIS-CHALMERS

*ORIGINATORS OF 5/8% STEP REGULATORS*

## Insist on complete UNIT CONSTRUCTION to speed untanking...

# bring maintenance out into the open

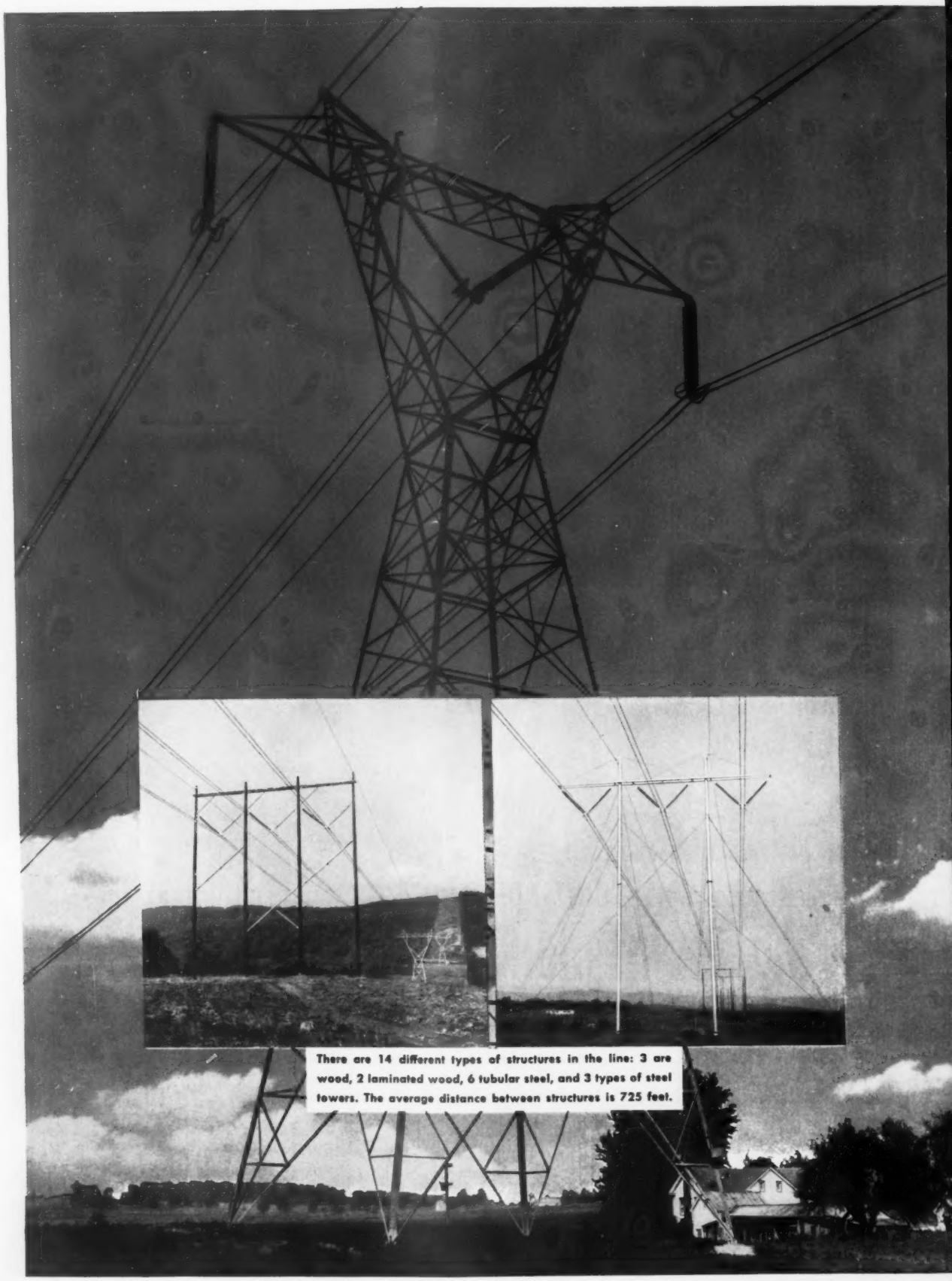
**Unit construction of the JFR regulator** simplifies untanking — brings all components and connections into full view! You make *all* internal inspections without breaking any electrical or mechanical connection. And you can *operate* the regulator for testing while the unit is untanked.

**More JFR maintenance cost-cutting features:** Oil sight gauge lets you check oil level at a glance. Unidirectional breather removes moisture and gases formed during tap changes. Quick-break mechanism is simple, rugged with a minimum number of moving parts for long, maintenance-free life. Externally-mounted by-pass arrester offers positive, visual proof of series winding protection.

Should you need a regulator replacement part — A-C maintains nationwide stocks. *Specify* **Allis-Chalmers** *Regulators . . . call, write or wire your nearby A-C office.*

**Exclusive CALIBAND control** cuts control-setting time without changing customer voltage or line-drop compensator settings.

Caliband is an Allis-Chalmers trademark. A-1419



There are 14 different types of structures in the line: 3 are wood, 2 laminated wood, 6 tubular steel, and 3 types of steel towers. The average distance between structures is 725 feet.

# AMERICA'S "BIG-VOLT" LINE protected by ALUMOWELD OVERHEAD GROUND WIRE

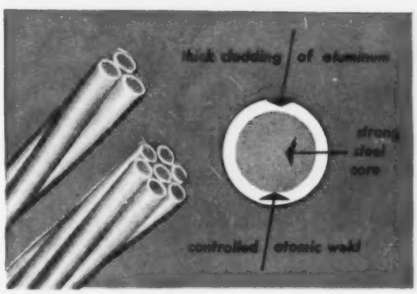
Like the famed "Big Inch" in the oil industry, Pennsylvania Electric Company's "Big Volt," its new 460-KV transmission line, represents a bold step forward in supplying the growing energy needs of America.

To protect the highest voltage operational line in America from lightning and transient currents, Penelec is using Alumoweld Overhead Ground Wire. This dependable, low-cost shield wire has three times the electrical conductance of steel, is just as strong and weighs 18% less. It has the same long life as solid aluminum.

Alumoweld is the result of the first successful cladding of a *thick* layer of pure aluminum over a high-strength steel core. The concentric aluminum covering comprises 25% of the cross-sectional area of each wire. Its high strength-to-weight ratio—higher than any other overhead ground wire—permits stringing with greater mid-span clearance to provide maximum lightning protection. Alumoweld's excellent conductivity assures reliable operation of protective relays and effectively discharges transient currents to ground.

Order Alumoweld Overhead Ground Wire and get Low-Cost, Long-Life Protection for your transmission lines.

*For more complete Alumoweld data send for Engineering Bulletin E.D. 3000.*




**A seven-strand Alumoweld Overhead Ground Wire (7 No. 6 Awg wires), approximately ½-inch in diameter with a breaking strength of over 22,700 pounds, is used to protect the highest voltage transmission line in America.**

ALUMOWELD®

**COPPERWELD STEEL COMPANY**

**WIRE AND CABLE DIVISION Glassport, Pa.**

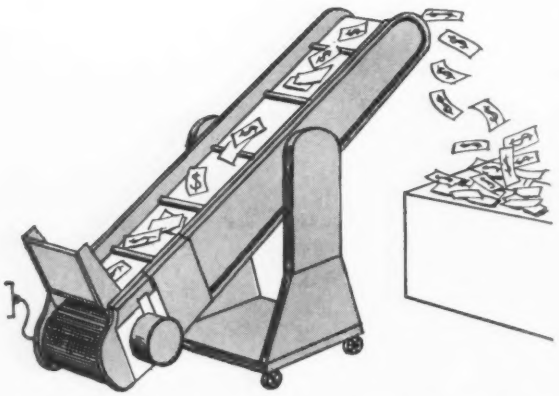
For Export: COPPERWELD STEEL INTERNATIONAL COMPANY, New York

Canadian Distributor: NORTHERN ELECTRIC COMPANY LIMITED

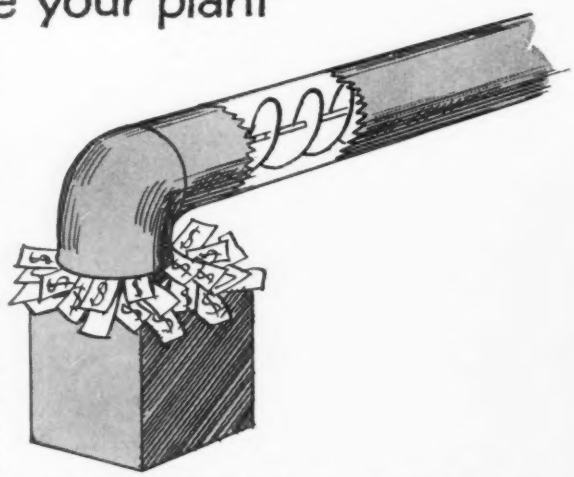
*For phone number of closest representative see advertising index in back of book.*

# GET A "MONEY MACHINE"

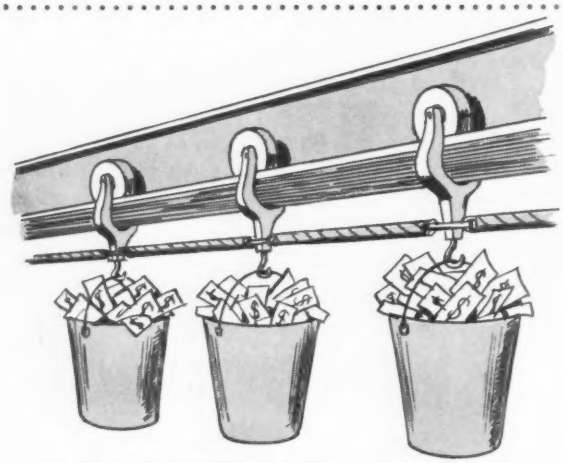
## to modernize your plant



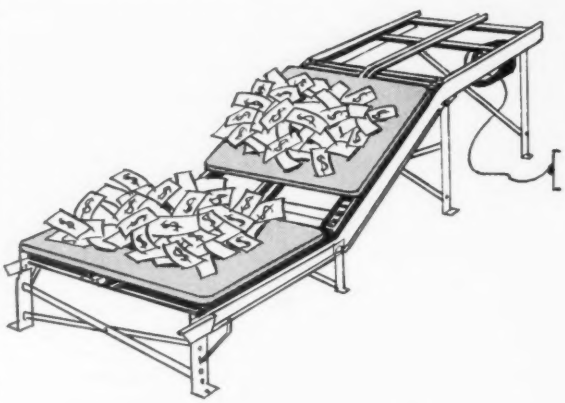
**PORTABLE PILER.** Versatile machine moves cartons, sacks, bundles fast. Has adjustable incline, reversible belt.



**BULK MOVER.** Modern screw conveyor is the simplest way to move bulk materials and to control amount and speed of flow.



**FLOOR-SPACE SAVER.** Overhead conveyor moves materials continuously, acts as mobile storage, too. Takes load off valuable floor space.



**ASSEMBLY SPEEDER.** Flexible, low-cost guided pallet conveyor system cuts process time. Sections are interchangeable, easily moved.

**Efficient materials handling** can make money for you by increasing production, cutting work-in-progress, handling greater volumes of materials, and saving floor space. These are only a few of the new machines and devices that can be bought or leased to modernize your plant. Call PG&E's Industrial Sales Department for other ideas and suggestions.

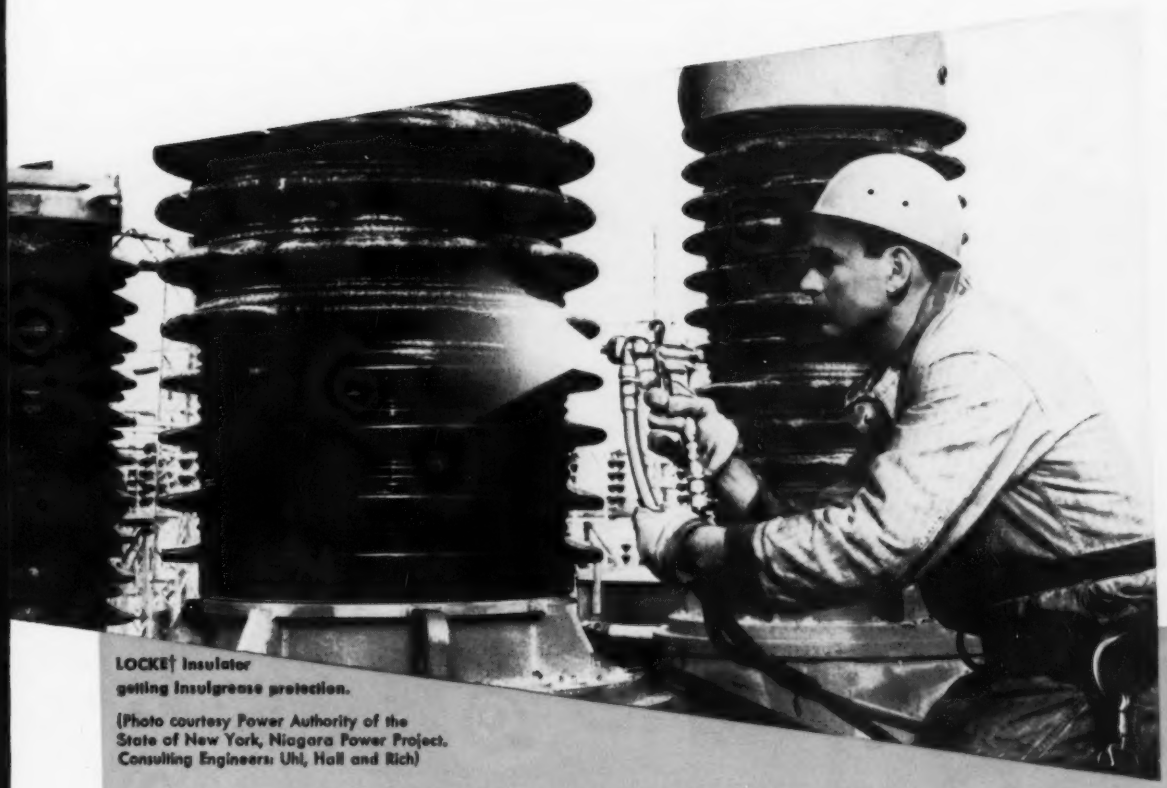
***PG&E Service is your best bargain***

P·G and E·

*Pacific Gas and Electric Company*

# kill contamination!

## *spray on* INSULGREASE* *for*



LOCKE† Insulator
getting Insulgrease protection.

(Photo courtesy Power Authority of the
State of New York, Niagara Power Project.
Consulting Engineers: Uhl, Hall and Rich)

## FAST, COMPLETE PROTECTION

Here's the newest, fastest way to get positive, low-cost protection against insulator contamination . . . simply spray on easy-to-use Insulgrease silicone coating. Pictured above is the huge Niagara Switchyard of the Power Authority of the State of New York. It covers 48 acres . . . contains 21 bays of 115, 230 and 345 kv equipment. Here, by attaching pressure equipment to drums of Insulgrease, protection against contamination was quickly sprayed on the insulators. With Insulgrease, there was no gumming up, no overspray, no fogging, no wasted material—just lasting protection. When needed, another spray application . . . right over the first layer . . . will restore original characteristics.

**INSULGREASE—THE POSITIVE ANTI-CONTAMINANT**

Dual-action Insulgrease silicone coating repels water and absorbs contaminants to give thorough protection. Spray over any dry surface—clean or contaminated—to any thickness. Insulgrease resists oxidation, moisture, salt spray, fungi, chemical attack, heat, cold and ultra-violet rays.

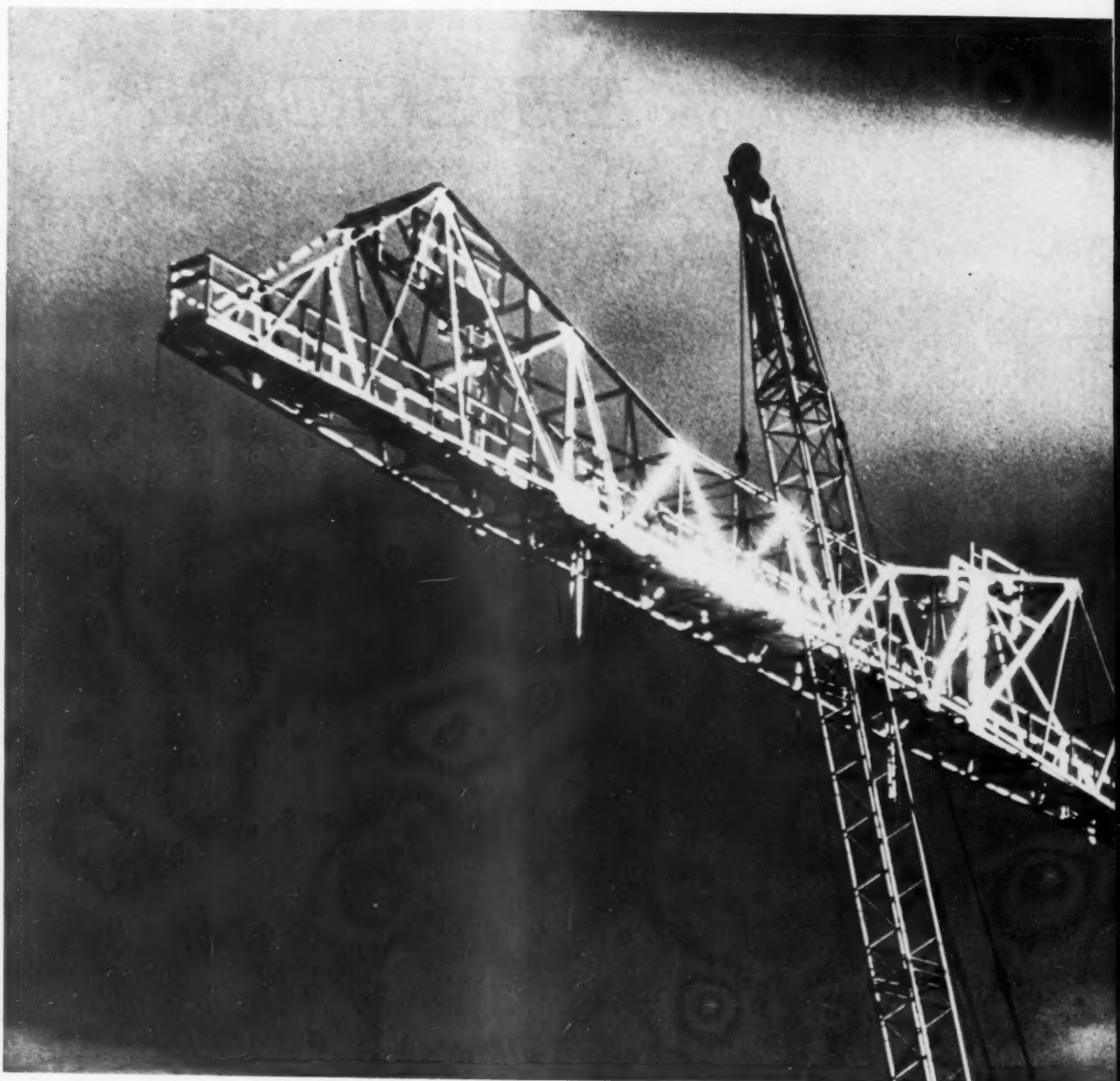
Get the full details on Insulgrease protection now. See your LOCKE Insulator representative, or, for technical literature and sample of Insulgrease, write to:

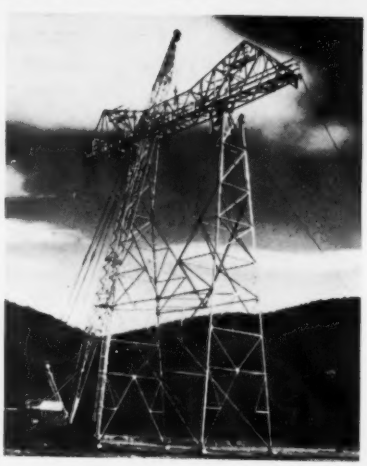
**Insulator Department**
**General Electric Co., P. O. Box 57**
**Baltimore 3, Maryland**

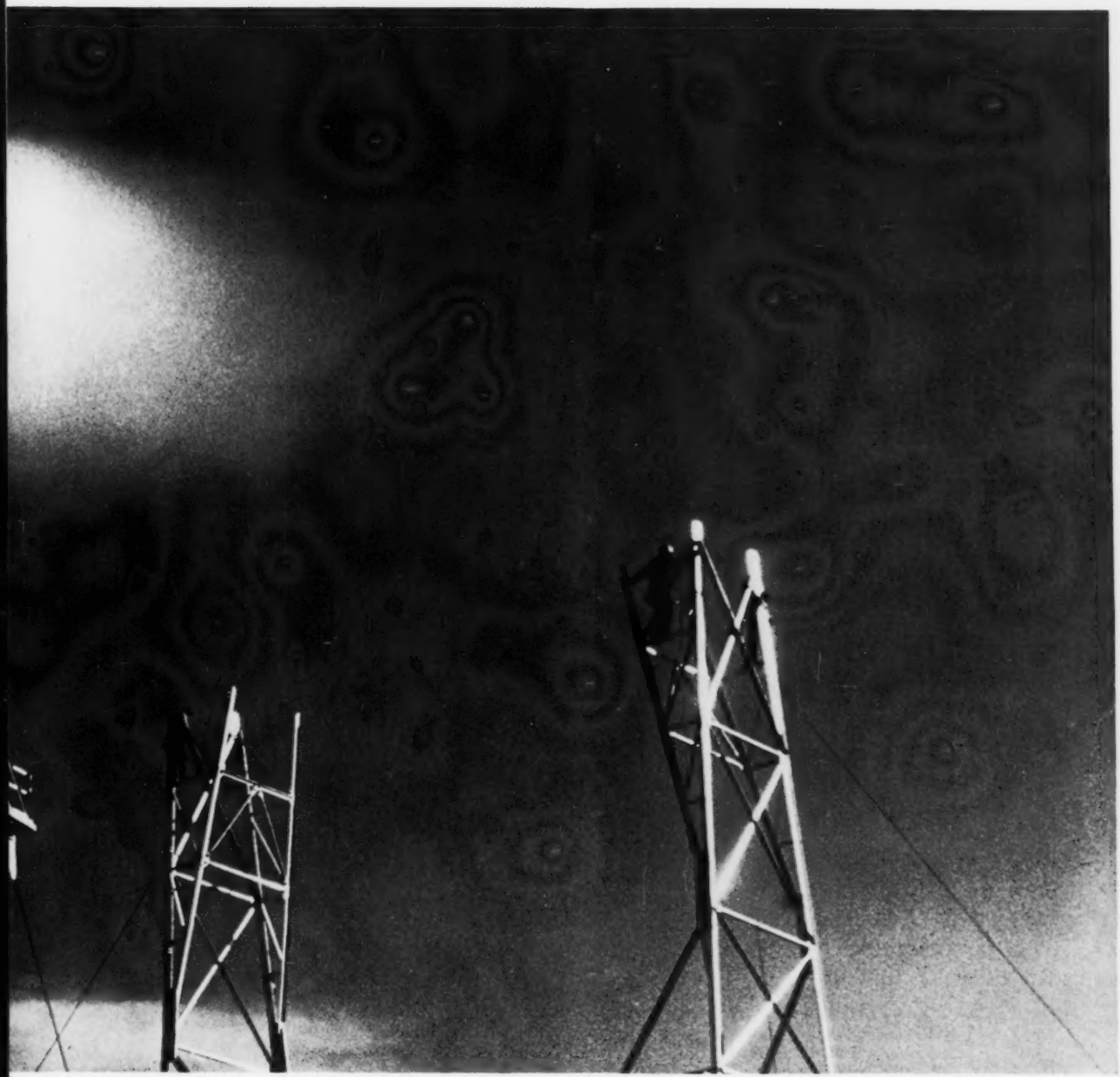
*Progress Is Our Most Important Product*

**GENERAL ELECTRIC**

*Registered Trademark of the General Electric Co.
†Trademark of the General Electric Co.





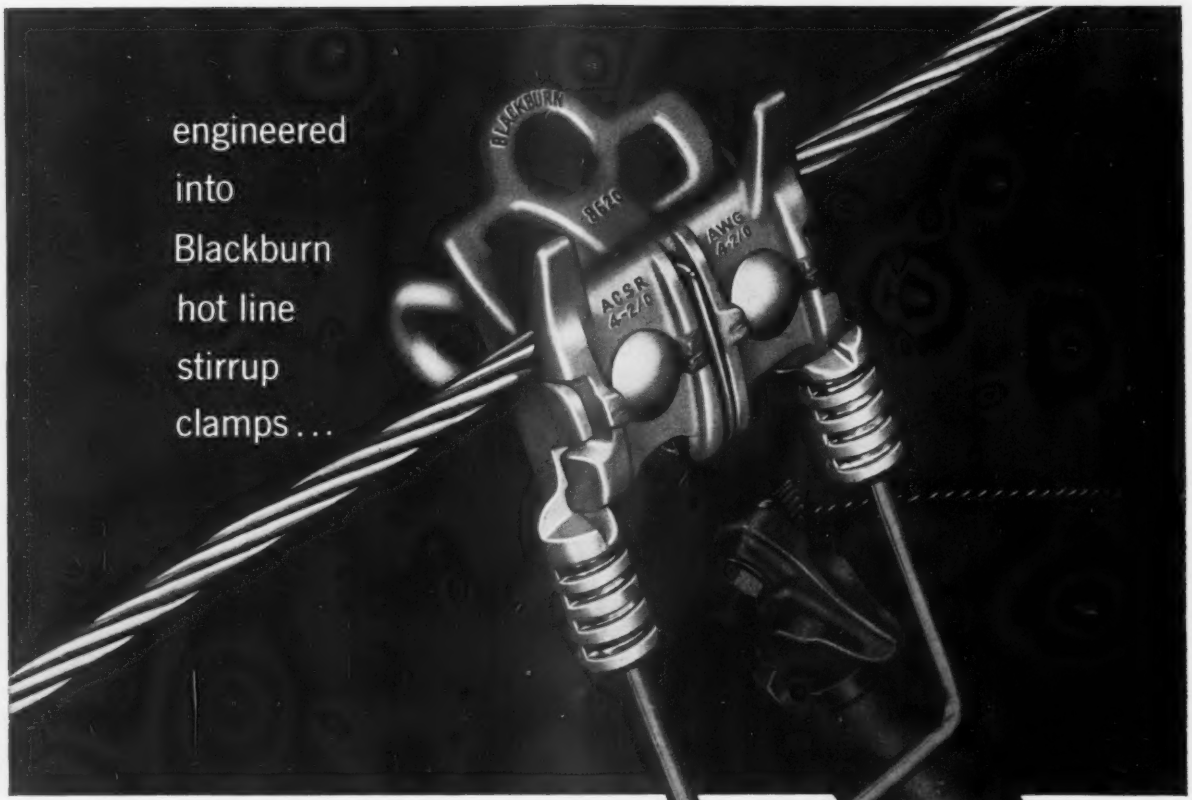


Alcoa Structural Division designs and fabricates aluminum towers that can be **erected fast—often in a matter of hours.** Lightweight aluminum towers (and substation structures) can be manufactured economically and require no maintenance.

Write: Aluminum Company of America, Structural Division, 873-D Alcoa Building, Pittsburgh 19, Pa.

ALCOA ALUMINUM
STRUCTURAL DIVISION

*For phone number of closest representative see advertising index in back of book.*




patent applied for

# PROTECTION AGAINST MAIN LINE DAMAGE

Blackburn SC series clamps offer an effective way to protect main conductors against damage from hot line taps without the use of armor rod. Tap is made on extended bail . . . not on the main conductor.

High clamping force of massive clamp is maintained over large contact area, making a low resistance, cool operating main line connection. A low resistance, balanced current path is fed to the bail from both legs of the clamp. The bail is mechanically bonded to the clamp body with interlocked tubular compression sealed joints.

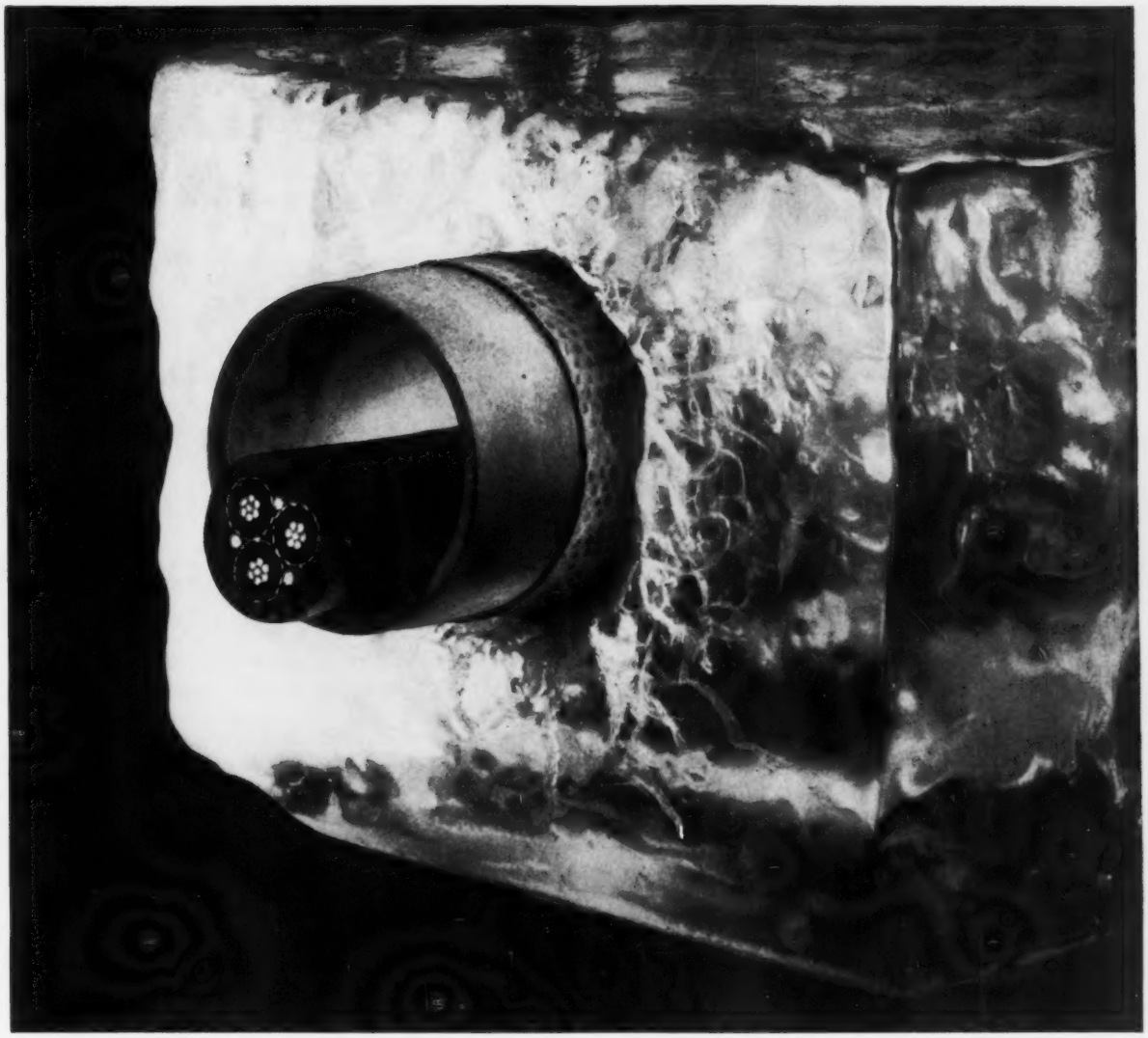
Castings are of high strength, non-copper bearing aluminum alloy. Clamps may be used on either aluminum or copper mains. When used on copper it is necessary to order prefilled with Contax, a highly efficient inhibiting paste. Bails are provided in bare copper, tin plated copper or aluminum. All bails are available straight or with a 45° offset.

Blackburn stirrup clamps are easily installed hot or cold. Hex nuts or eye nuts (that fit all shotgun sticks) are available. A permanent steel spring secured to the body of the clamp imparts a strong snap grip on the interlocking jaws, supporting the clamp on the main while bolts are being tightened. Only two clamps cover a main wire range from No. 4 AWG through 397.5 ACSR.

*For complete information, write for catalog data sheet and samples.*

Jasper
**BLACKBURN**
Corporation

**1525 Woodson Road • Saint Louis 14, Missouri**

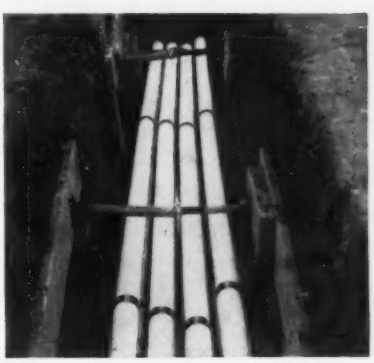


# Cooler cables at lowest costs with Transite Ducts!

Do you know that electrical system losses amount to more than four hundred million dollars annually? Research shows that these losses can be drastically reduced by improving the dissipation of heat from conductors under load. The most efficient and economical way to accomplish this is with inorganic Transite® Ducts.

Tests prove that asbestos-cement Transite Ducts can actually have as much as 10.6% greater heat-carrying ability than organic ducts. This means that when a conductor is supplying a given load, its temperature will be substantially lower in Transite. These cooler cables result in lower electrical resistance with correspondingly lower $I^2R$ losses. At a $20/KW cost, this can save you as much as $8.20 per thousand feet a year. Lower operating temperatures mean longer cable life and more reliable service, too!

Because of their 10′ lengths and speedy coupling method, Transite Ducts can be installed at the lowest cost. Get the full story by writing Johns-Manville, Box 14, EW-4, New York 16, N. Y. In Canada: Port Credit, Ontario.



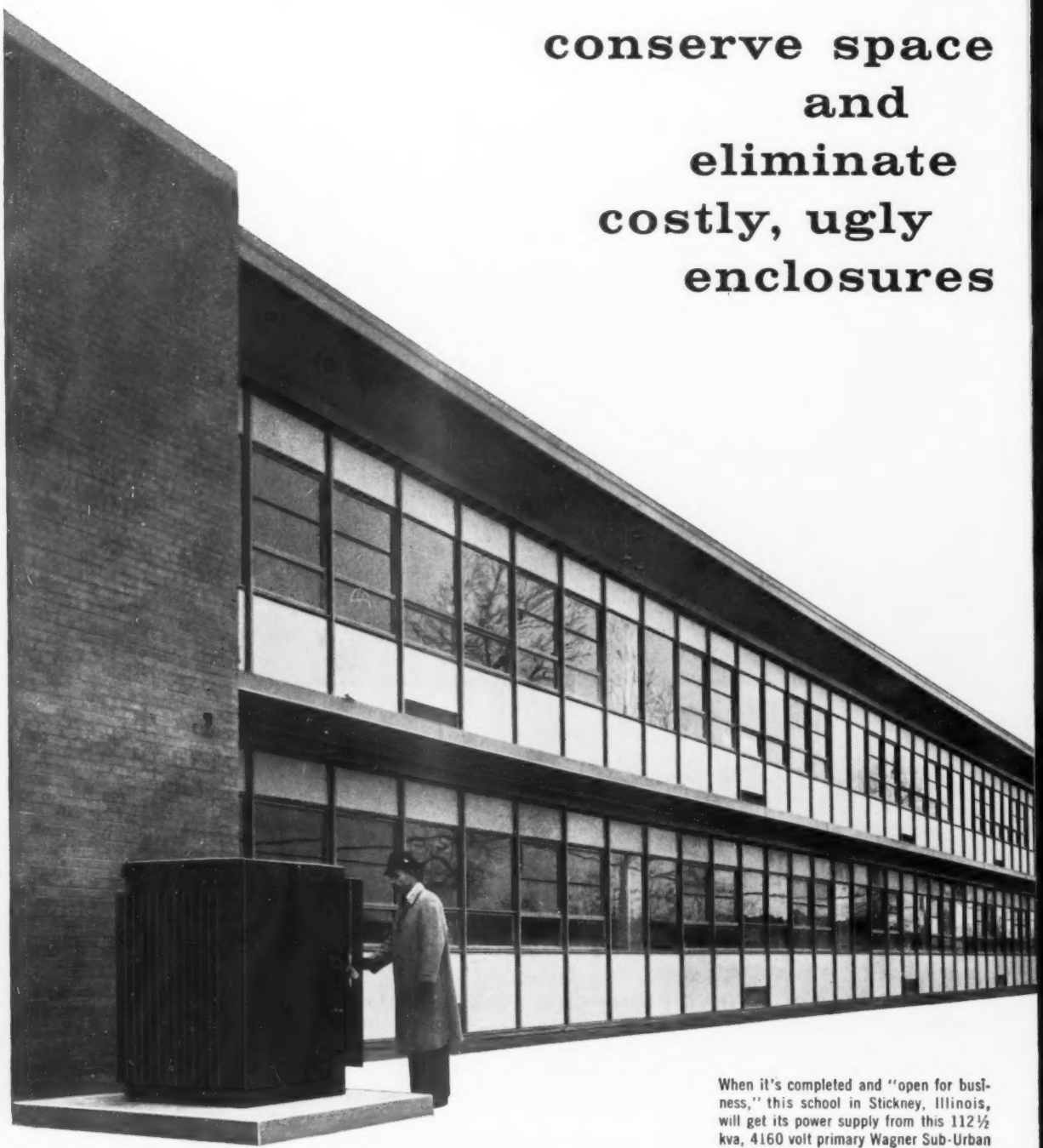
JOHNS-MANVILLE

*For phone number of closest representative see advertising index in back of book.*

*In Industrial and Commercial Installations . . .*

# WAGNER® SUB URBAN PAD

**conserve space and eliminate costly, ugly enclosures**



When it's completed and "open for business," this school in Stickney, Illinois, will get its power supply from this 112½ kva, 4160 volt primary Wagner Sub-Urban transformer.

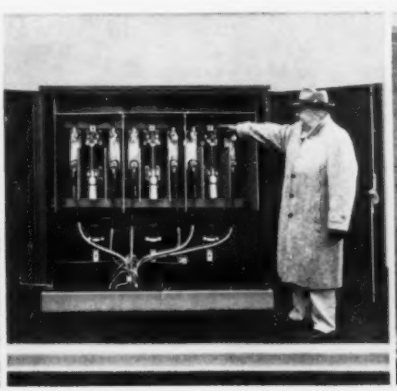
# MOUNTED TRANSFORMERS

Thinking of going undergound? If you're planning a new distribution substation... reworking or modernizing an existing system... write Wagner® Sub-Urban pad mounted transformers into your specifications. It's the economical way... the complete unit is mounted above ground, and no costly vaults or enclosures are necessary. Save space, too. They're so well ventilated they can be installed close to the building and still be loaded to capacity. Some low shrubbery will hide them neatly... the good looks of your buildings and landscaping are retained.

Incoming lines and outgoing feeders are completely out of sight, buried in the ground. And far fewer faults occur in an underground system over a period of time than would generally occur in a comparable overhead system. People who use the buildings served by pad mounted transformers are protected from exposed hot lines, and your crews are protected by a door over the primary compartment which lets them work on the secondary without danger from high voltage. Enclosures lock tightly to protect the equipment itself.

Wagner Sub-Urban pad mounted transformers are available in singlephase, 25-167 kva; three-phase 75-750 kva. They require only routine maintenance, and when load growth makes it necessary, larger transformers can be quickly and easily installed to replace original units.

This Wagner Sub-Urban transformer is installed at the Park Ridge, Illinois, executive offices of the Square D Company. It is a 500 kva, three-phase delta-connected, 4160 volt primary transformer.



H. D. Ely, senior staff engineer of a large midwestern utility points to the special HV switching arrangement which permits sectionalizing the primary of a three-phase loop system at the Square D Company.

These transformers serve the Dorcherster Club in Dolton, Illinois. The larger transformer supplies power to refrigerate an indoor skating rink. The smaller unit powers the club's general services and all-electric kitchen.

*Check with your Wagner Sales Engineer. He's got complete data on Sub-Urban pad mounted transformers... all the facts and figures that prove how easy it is to plan less costly, space-saving transformer installations.*

BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

**Wagner Electric Corporation**

6381 PLYMOUTH AVENUE, ST. LOUIS 33, MISSOURI

WT61-1

*For phone number of closest representative see advertising index in back of book.*

Home of Mr. and Mrs. B. G. Bergeron, Montebello, California

# Count the things that change for the better

*when you move up to a TOTAL-ELECTRIC GOLD MEDALLION HOME*

***(It costs so little to live better electrically)***

"When we built our Gold Medallion Home, I discovered how simple and inexpensive housekeeping can be," says Mrs. Bergeron. "Everything stays so clean. I do my own work, yet I have *more* time to enjoy my family. An all-electric home is the only really modern home."

And these are the reasons why:

**1. Flameless electric heat.** "Electric heat is *even* heat—no too-hot rooms or cold ones. And no discoloration on walls and ceilings."

**2. A flameless electric range.** "I love to cook with electricity—you know just how long each type of food will take. And it doesn't soil my pans—I save hours of scrubbing every week."

**3. A flameless electric oven.** "My electric oven keeps the tasty juices *in* the meats—cooks them *so* tender."

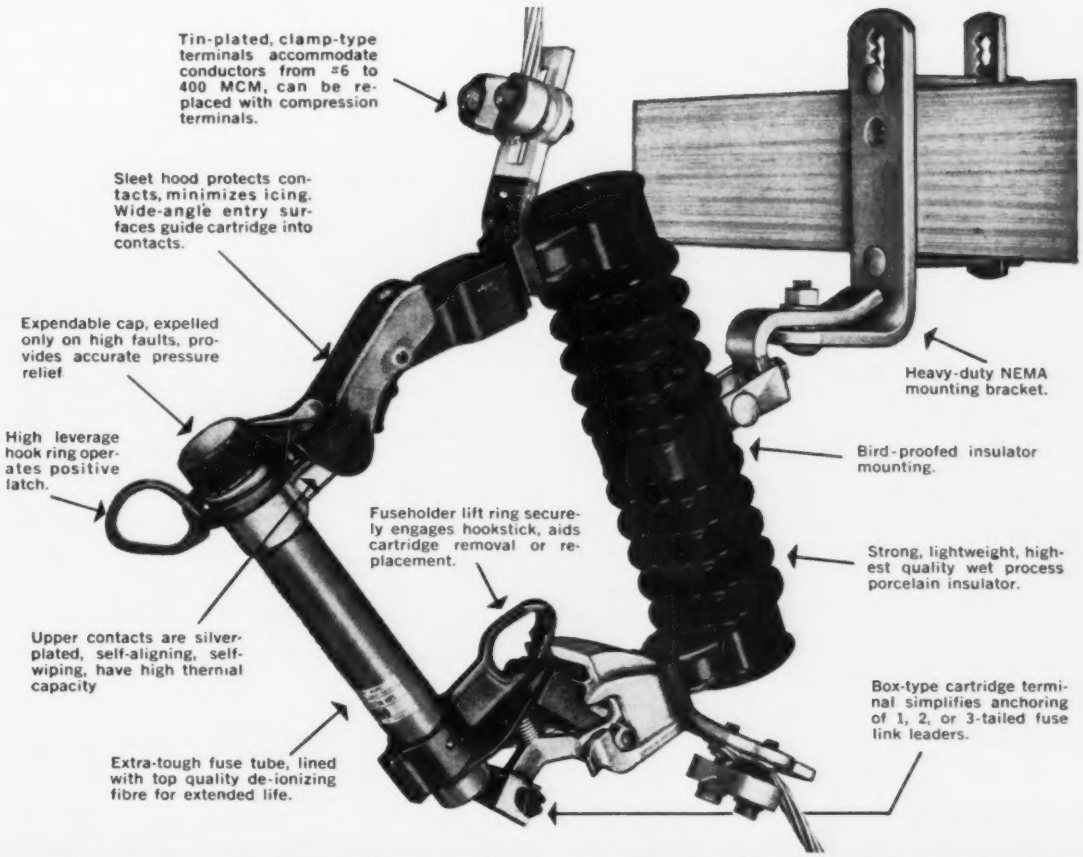
**4. A flameless electric dryer.** "Electric drying keeps towels and sweaters fluffy as new. I even put in my 'drip drys' and they come out wrinkle-free."

**5. A flameless electric water heater.** "Our electric water heater operates quickly, quietly and economically." Being flameless, electric water heaters can be placed anywhere—in a closet, in a corner or under a cabinet.

***WHAT IS THE GOLD MEDALLION HOME AWARD?*** It is an award given only to total-electric homes that are electrically up-to-date. When a new home meets Gold Medallion Home requirements you know it offers: *clean, flameless, electric space and water heating; a clean, flameless, electric kitchen*, equipped with major appliances; plenty of "*Housepower*"—modern wiring to handle today's and tomorrow's appliances; *abundant lighting*, planned for comfort, convenience and beauty.

***When the future is all-electric, why buy anything but a total-electric Gold Medallion Home?***

SOUTHERN CALIFORNIA Edison COMPANY


Tin-plated, clamp-type terminals accommodate conductors from #6 to 400 MCM, can be replaced with compression terminals.
Sleet hood protects contacts, minimizes icing. Wide-angle entry surfaces guide cartridge into contacts.
Expendable cap, expelled only on high faults, provides accurate pressure relief
High leverage hook ring operates positive latch.
Fuseholder lift ring securely engages hookstick, aids cartridge removal or replacement.
Upper contacts are silver-plated, self-aligning, self-wiping, have high thermal capacity
Extra-tough fuse tube, lined with top quality de-ionizing fibre for extended life.
Heavy-duty NEMA mounting bracket.
Bird-proofed insulator mounting.
Strong, lightweight, highest quality wet process porcelain insulator.
Box-type cartridge terminal simplifies anchoring of 1, 2, or 3-tailed fuse link leaders.

# NEW KEARNEY 200 AMP "HX" CUTOUT

## Kearney substation-proved to positively and repeatedly interrupt 12,000 amperes at 7.8 KV . . . 10,000 amperes at 15 KV

- No "blind" spots . . . a highly efficient combination of single end venting and expendable cap double venting insures dependable interruption throughout the entire fault range . . from low current values to maximum rated capacity of the cutout.
- On low and medium faults, expendable cap remains intact . . . tube vents only at bottom. Controlled spring loading and long travel of lower hinge toggle whips fuse cable out of cartridge to insure positive low current interruption.
- Expendable cap is expelled only on high faults. Resultant double end expulsion in line with fuse tube relieves gas pressure, equalizes interruption shock forces and prevents damage to cutout or bracket.
- Switchstick-operated positive latch prevents accidental cartridge dropout due to vibration, impact, or magnetic forces.
- Strong, durable, non-ferrous construction for long life, optimum performance. All current-carrying parts copper alloy. Silver-plated contacts. Stainless steel pins and springs.
- Fuseholders accept all conventional button-type links.
- Kearney "HX" Fuse Cutouts are available on single insulator, NEMA station-post, or centerbolt insulator mountings; also in 100 ampere continuous ratings.

*Ask your Kearney Sales Representative for full information or write for "HX" Cutout Bulletin*

KEARNEY

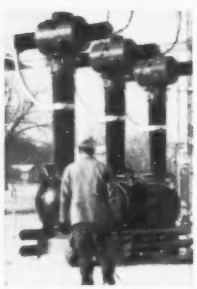
**JAMES R. KEARNEY CORPORATION**

4224-42 Clayton Avenue, St. Louis 10, Missouri

PLANTS AT: ST. LOUIS • FAYETTEVILLE, ARKANSAS • SHENANDOAH, IOWA
CLARINDA, IOWA • GUELPH, ONTARIO, CANADA • ST. THERESE, QUEBEC, CANADA

502

In the West: for prompt service, contact Kearney's West Coast Distributor, **MAYDWELL and HARTZELL, INC.** Los Angeles • Seattle • Portland • San Francisco • Spokane • Phoenix



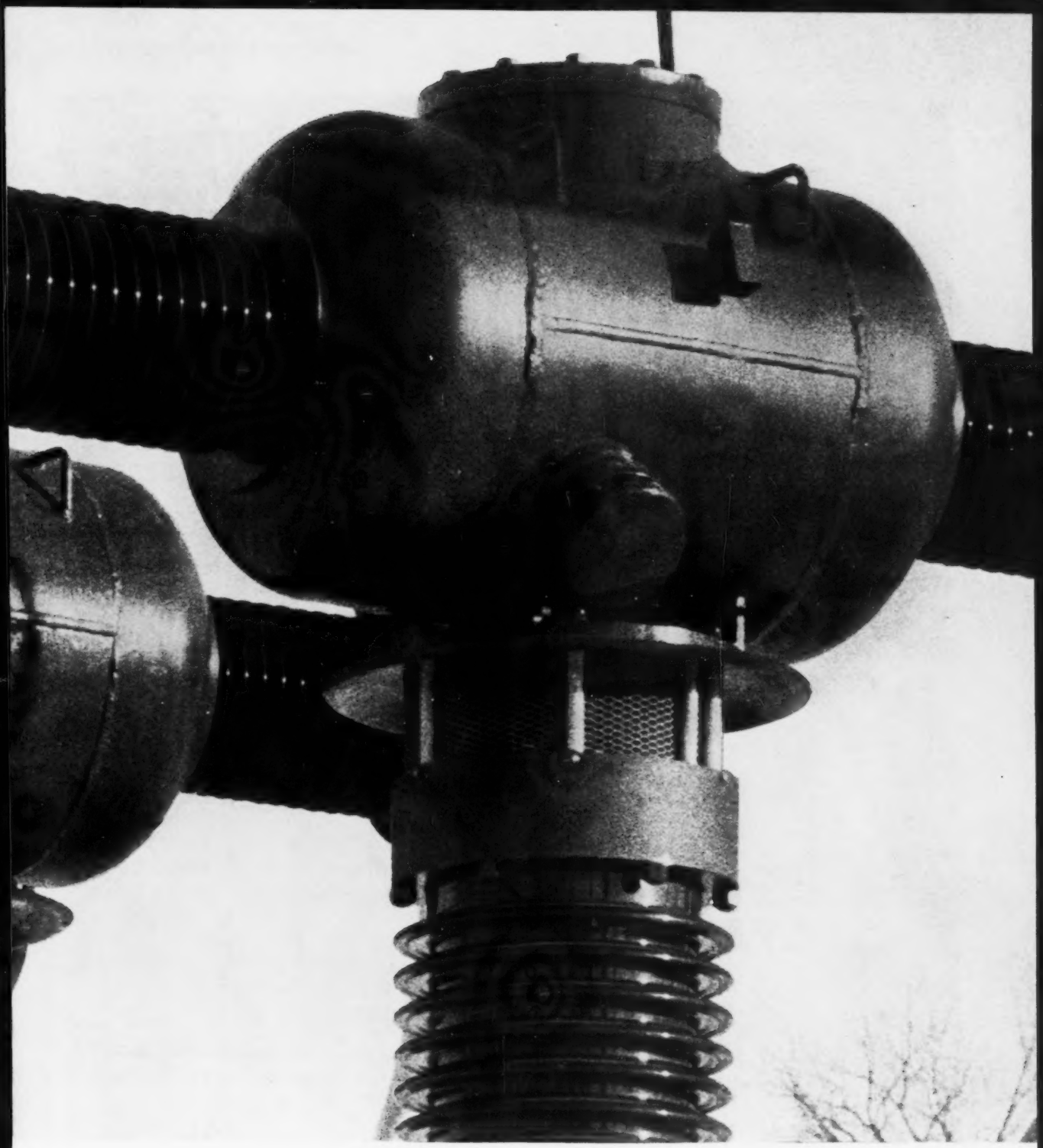
GENERAL ELECTRIC AIR BLAST BREAKERS . . .

## Interrupt power faults in 1/20th of a second or less

It happens in a lamp bulb flicker your customers won't even notice.

At installations like the United Illuminating Company's new Sackett Point Substation (above), General Electric ATB Air Blast Breakers provide lightning-fast interruption to clear a fault in three cycles or less—1/20th of a second.

Faster yet, pioneering Air Blast installations of the American Electric Power System, now on order, will clear the backbone of its 345 kv trans-



mission network in two cycles—snuffing out the equivalent of 33½ million horsepower in 1/30th of a second.

Speed means better stability for your system when it is challenged by one of today's high capacity power faults.

Speed means breaker contacts erode less, providing tangible maintenance and dollar savings.

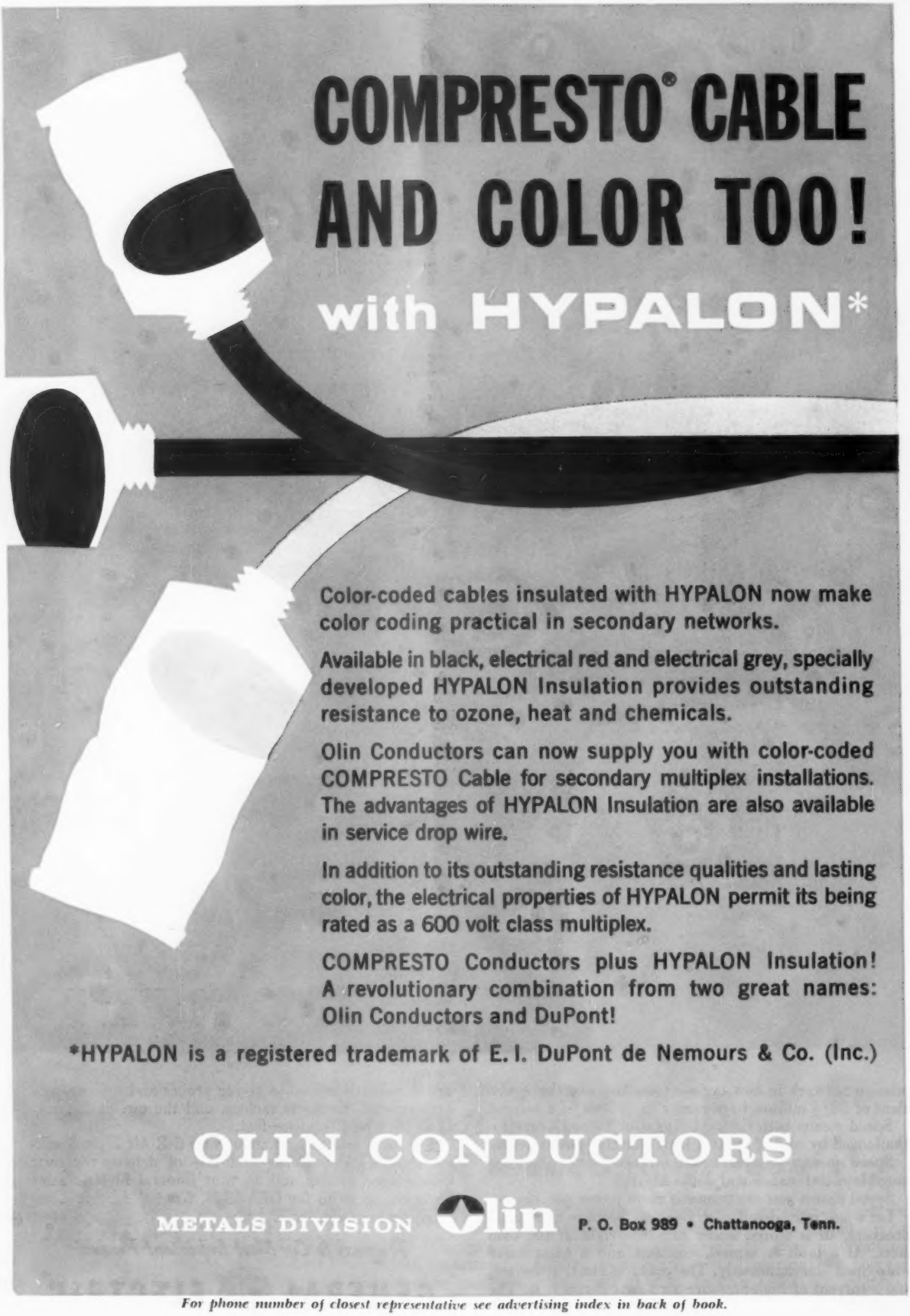
Speed means you can transmit more power per circuit.

Let's go into detail: In General Electric Air Blast Breakers, air is stored under pressure right at the contacts. As a fault is sensed, contacts and a blast valve whip open simultaneously. The contacts stretch the arc, and a torrent of high-pressure air blasts through it. The arc is instantly forced to arcing probes and orifices, and extinguished. Contacts reclose, and the circuit is ready to go back into service—fast.

For more information about why G-E Air Blast Breakers should stand as the first line of defense for your transmission system, talk to your General Electric sales engineer, or write for GEA-6908. *General Electric Company, Schenectady, N. Y.* 493-11

*Progress Is Our Most Important Product*

GENERAL ELECTRIC


COMPRESTO® CABLE
AND COLOR TOO!
with HYPALON*
Color-coded cables insulated with HYPALON now make color coding practical in secondary networks.
Available in black, electrical red and electrical grey, specially developed HYPALON Insulation provides outstanding resistance to ozone, heat and chemicals.
Olin Conductors can now supply you with color-coded COMPRESTO Cable for secondary multiplex installations. The advantages of HYPALON Insulation are also available in service drop wire.
In addition to its outstanding resistance qualities and lasting color, the electrical properties of HYPALON permit its being rated as a 600 volt class multiplex.
COMPRESTO Conductors plus HYPALON Insulation! A revolutionary combination from two great names: Olin Conductors and DuPont!
*HYPALON is a registered trademark of E. I. DuPont de Nemours & Co. (Inc.)
OLIN CONDUCTORS
METALS DIVISION Olin P. O. Box 989 • Chattanooga, Tenn.

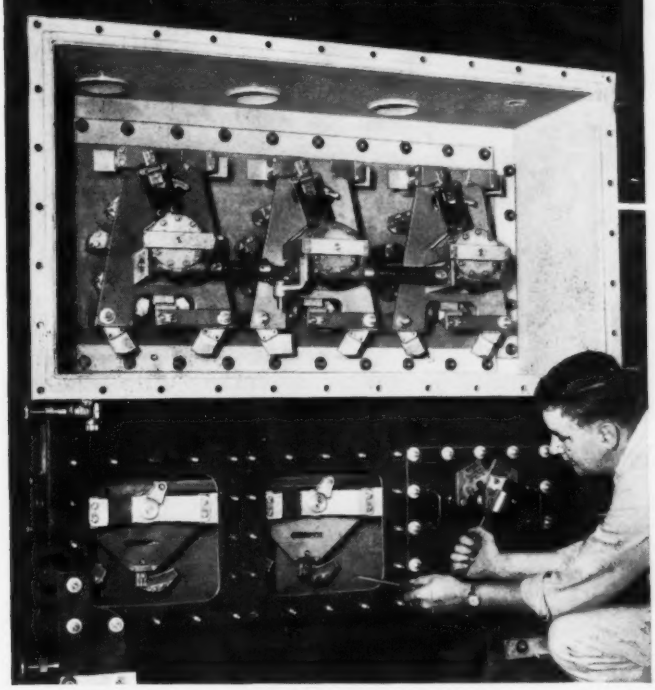

*For phone number of closest representative see advertising index in back of book.*

**eliminate transformer outages...**
**save on LTC maintenance...**

## WITH PENNSYLVANIA'S

# new isolating by-pass

## FOR LTC TRANSFORMERS



Three-phase by-pass with a "550" LTC on the assembly rack being prepared for test. Operating handle of by-pass has key interlock to prevent improper operation. Switch position can be checked through sight-windows.

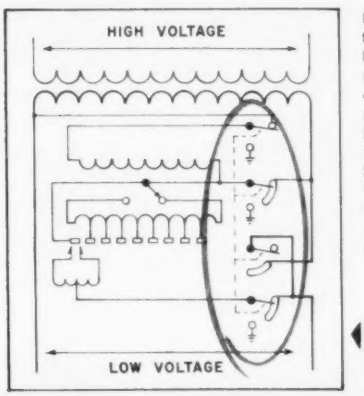
Periodic inspection and maintenance of load tap changing equipment is necessary, regardless of how good its quality. Since this work cannot be done on a conventional LTC transformer while it is energized, a costly outage must be arranged. This is not so when the LTC is provided with Pennsylvania's new by-pass facilities.

The integral by-pass assembly, originally developed for Pennsylvania's Phase-Isolated transformer, is a group-operated combination of by-pass, disconnecting and grounding switches. The LTC switches and mechanism can be completely isolated and grounded, permitting their safe inspection and maintenance *while the transformer continues to carry load.*

The proven operating advantages of the integral by-pass now can be secured with 3-phase LTC transformers of practically any kva and voltage rating. When compared to advantages gained, the cost of the addition is exceptionally small. For example, little more than $1,000 is added to the cost of a 10,000-kva unit.

It will pay you in many ways to investigate Pennsylvania's integral by-pass switch. Consider it when *planning* your next LTC transformer installation. For further information, write to Pennsylvania Transformer Division, McGraw-Edison Company, Canonsburg, Pennsylvania.

McGRAW EDISON



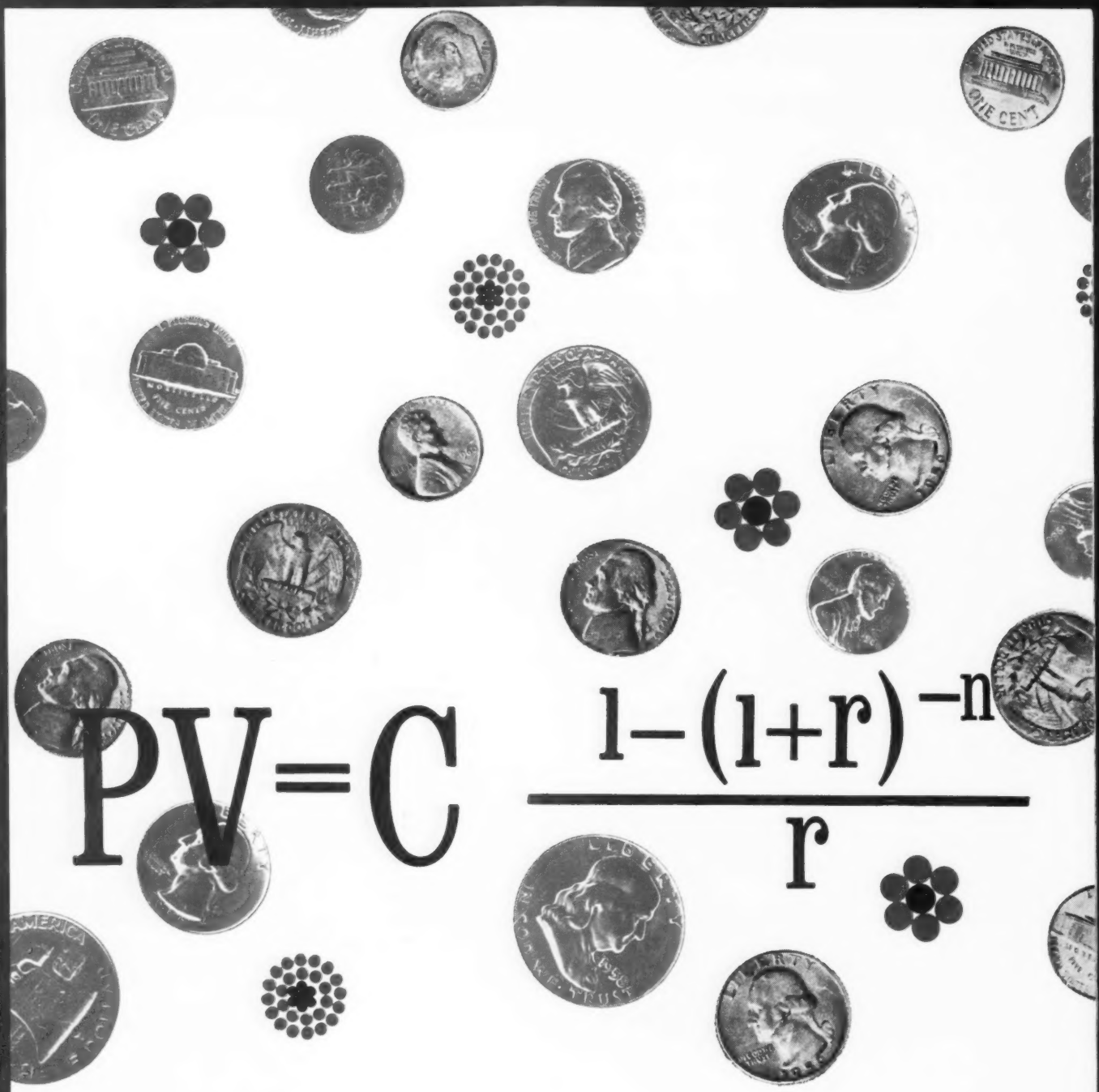

Typical connections for one phase of LTC by-pass switch assembly. Group-operated rotary switches are shown in normal operating position.

Patent pending

LTC transformer with by-pass facilities, stripped of accessory parts and loaded for shipment to a Western utility. By-pass switch, in an independent oil-filled compartment, and its single operating lever, are located below the compartment for the "333" LTC Switch. The unit is rated 21,000/28,000/35,000-kva, Class OA/FA/FA, HV: 132,000GrdY volts, LV: 45,000 GrdY volts, TV: 6600△ volts, with plus and minus 10% regulation in 32 steps of ⅝% each.

**PENNSYLVANIA LTC TRANSFORMERS**

*For phone number of closest representative see advertising index in back of book.*



$$PV = C\,\frac{1-(1+r)^{-n}}{r}$$

# How important is 1% more conductivity?

It can save you up to $100 per mile of overhead conductor.

Compare two conductors—one with a conductivity of 61%, the other, Alcoa ACSR, with a 62% minimum guaranteed conductivity. Assume all other characteristics are equal. Now you can compute the dollar savings per conductor mile as a result of the extra 1%.

*How much dollar savings?* You can find the long-range answer, using the formula actuaries use to determine present value (PV) of benefits:

$$PV = C\,\frac{1-(1+r)^{-n}}{r}$$

where C = annual savings in dollars
n = amortization period in years
r = annual interest rate

You can see how important 1% more conductivity is over the life of a conductor. If you took these savings into consideration at the time of purchase, you could actually afford to spend up to 3 cents per pound more for an overhead conductor with a guaranteed 62% conductivity.

*Alcoa gives you this important extra 1%—62% minimum guaranteed conductivity—at no increase in cost.*

It's one of many *extras* you get when you use Alcoa ACSR and Alcoa overhead accessories.

Your nearby Alcoa-Rome salesman can help with all your overhead needs. For the name of our nearest representative, write to Rome Cable Division of Alcoa, Dept. 4-41, Rome, N. Y.

ALCOA
ROME CABLE
DIVISION

A MESSAGE TO AMERICAN INDUSTRY · ONE OF A SERIES

***By our method of reporting unemployment...***

# We're Giving The United States A Black Eye That Is Not Deserved

**The way in which our unemployment is reported is giving the United States an undeserved black eye around the world. The broad concept of unemployment we use exaggerates the amount of unemployment in the United States as compared to most other countries. Our reporting system also falls short of presenting a balanced picture by concentrating on people who are idle, while neglecting jobs that are idle because people cannot be found to fill them.** This editorial explains these defects and suggests improvements.

The *Monthly Bulletin of Statistics*, issued by the Statistical Office of the United Nations, has become a standard reference for international comparisons of economic performance, including employment and unemployment. Here, from the November, 1960 issue, is part of a table giving comparative figures on the rate of unemployment for the United States and a group of European countries:

| | UNEMPLOYMENT RATE | |
|---|---|---|
| | Annual Average 1959 | Jan.-June Average 1960 |
| West Germany | 2.4% | 1.0% |
| Netherlands | 1.8 | 1.4 |
| Sweden | 2.0 | 1.8 |
| United Kingdom | 2.3 | 1.9 |
| United States | 5.5 | 6.1 |

## A Distorted Picture

If taken at face value the table clearly says that the United States is doing far worse in providing jobs for its citizens than the other countries whose unemployment records are listed.

**But the figures are deceptive.** They are made so, in part, by our government's use of a much broader concept of what constitutes unemployment than is used by most other countries.

Sweden provides a clear case in point. The table indicates that during 1959 Sweden had an unemployment rate of 2.0%, while the rate in the

United States was 5.5%. But a report from Sweden, published in the U.S. Department of Labor's *Labor Developments Abroad*, indicates that if they had used the same methods of calculating unemployment as we, the reported jobless rate in Sweden would have almost doubled. Thus a large portion of the gap between the unemployment rate in the United States and the unemployment rate in Sweden would have been eliminated.

## Graduation To Unemployment

In general, countries listed in the table use registrations at public employment agencies as the basis for calculating their unemployment. Our Department of Labor, in making its sampling of unemployment, includes unregistered young people who are waiting for jobs or training opportunities as well as housewives who are looking for jobs in a general sort of way but who have not registered anywhere in search of them.

It used to be that graduation from college was regarded as a day for great celebration and rejoicing. But, because of the way the Labor Department does its counting of unemployment, it is now a day of sorrow. For unless our young people immediately rush off to jobs, they graduate into unemployment and swell our jobless figures.

**While our government very expansively counts all the unemployed, there is no offsetting report on the number of jobs that are unfilled because no one qualified can be found to fill them.** Currently there are many jobs in this category, and it is to be expected that there will be more as the technological revolution picks up momentum.

A properly balanced report on unemployment would include a record both of people who are idle, as conceived on some standard international basis, and jobs that are idle. A combination of the two sets of data would provide a much better indication of the economic health of a nation than unemployment alone.

The United Kingdom regularly collects figures on unfilled jobs as well as the number of unemployed. Thus it is not an impossible task to collect information on idle jobs. **For a fast moving economy, such as ours, the collection of statistics on unfilled jobs presents special difficulties. But this information is so important that Congress should see that it is added to our employment and unemployment records.**

## A National Disservice

There is not the slightest inclination here to minimize the amount of unemployment in the United States at any time, or the crucial importance of doing everything possible to keep it at rock bottom. If the reporting of unemployment were simply for domestic consumption, it would be possible to make an appealing case for using a very broad conception of it. This is one way of underlining the importance of the problem.

But when, as is the case, international comparisons of unemployment are treated as key gauges of the effectiveness of different economies, we do ourselves an important national disservice by using an exceptionally commodious concept of unemployment. American travelers abroad can testify that they are continuously being called upon to explain why the United States does such a relatively poor job in providing employment for its people. This is an unwise and unfair burden to impose upon the nation. **We make enough mistakes of economic commission and omission without issuing reports that distort our economic performance to our own discredit abroad.**

This message was prepared by my staff associates as part of our company-wide effort to report on major new developments in American business and industry. Permission is freely extended to newspapers, groups or individuals to quote or reprint all or part of the text.

Donald C. McGraw

PRESIDENT

McGRAW-HILL PUBLISHING COMPANY

**Effective power plant automation requires:** a computer designed specifically for steam power plant process control; complete understanding of power plant equipment and processes for proper computer application · **Westinghouse provides this combination.**

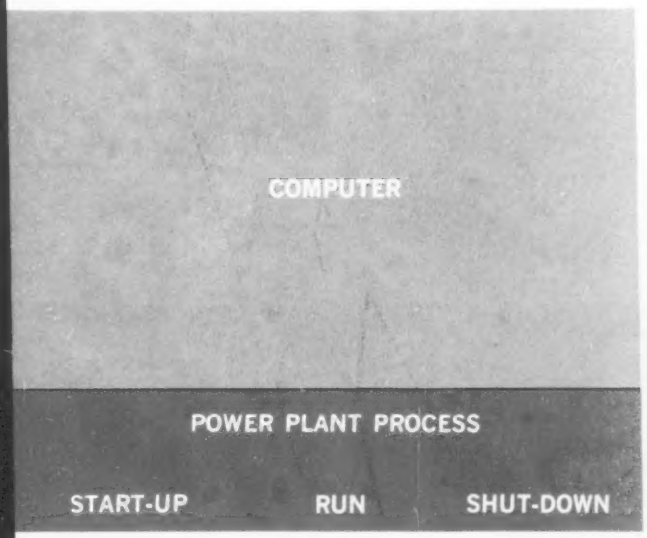
# Westinghouse understanding of power plant operations is basis for PRODAC-IV design and application

There are two equally important parts to automating a plant. One is a good understanding of the process to be controlled. The second is the effective application of a large, reliable, solid-state digital computer specifically designed to supervise sequencing and control operations of the power plant process.

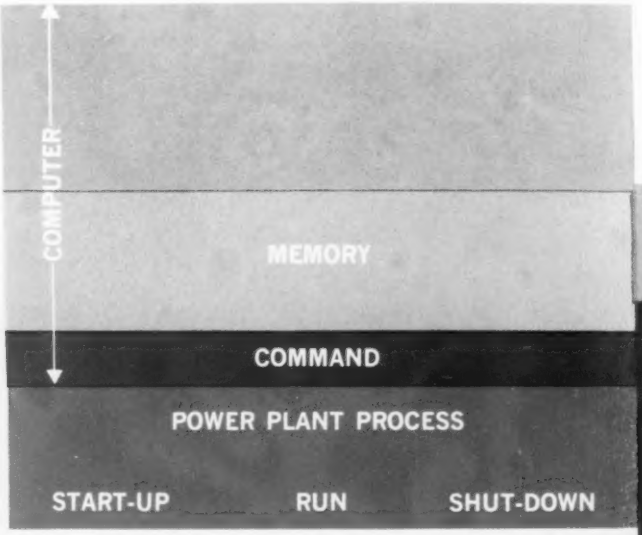
Westinghouse alone, with the PRODAC*-IV Computer system, is able to fulfill both parts of the problem. The series of illustrations numbered 1 through 4 shows how the Westinghouse PRODAC-IV system is matched to the total steam power plant process.

The remaining illustrations show how signals are

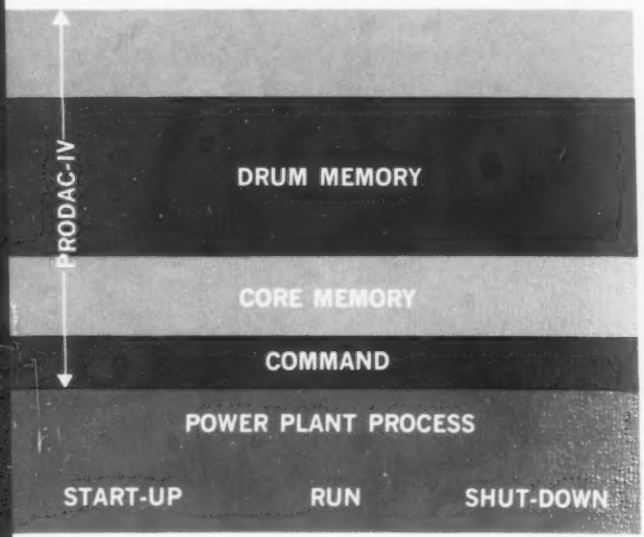
*Trademark



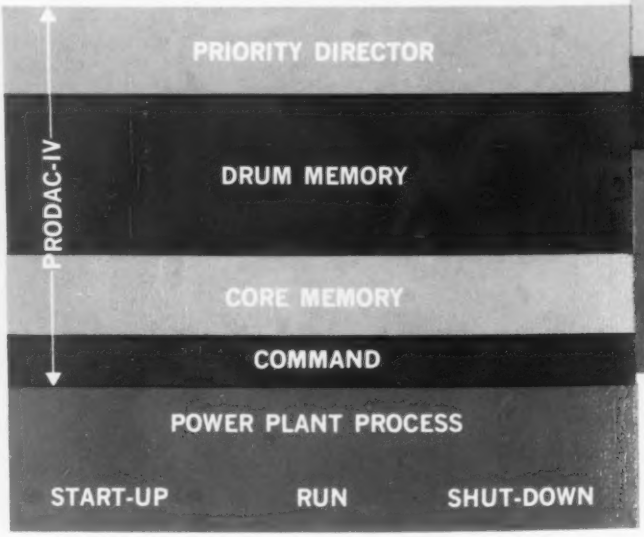

1 ANY COMPUTER, to provide full control of a steam power plant, must be matched to the total process from startup to shutdown. Full knowledge of plant dynamics is essential to make sure computer is able to handle all functions.




2 BOTH MEMORY AND COMMAND functions must be provided in the computer. The memory contains the thousands of instructions needed to control the process. The command system executes these instructions.




3 PRODAC-IV incorporates a drum and core combination memory. The drum provides economical bulk storage while the core permits rapid access. This system is more than equal to the task of controlling equipment directly during critical start-up and shutdown periods.



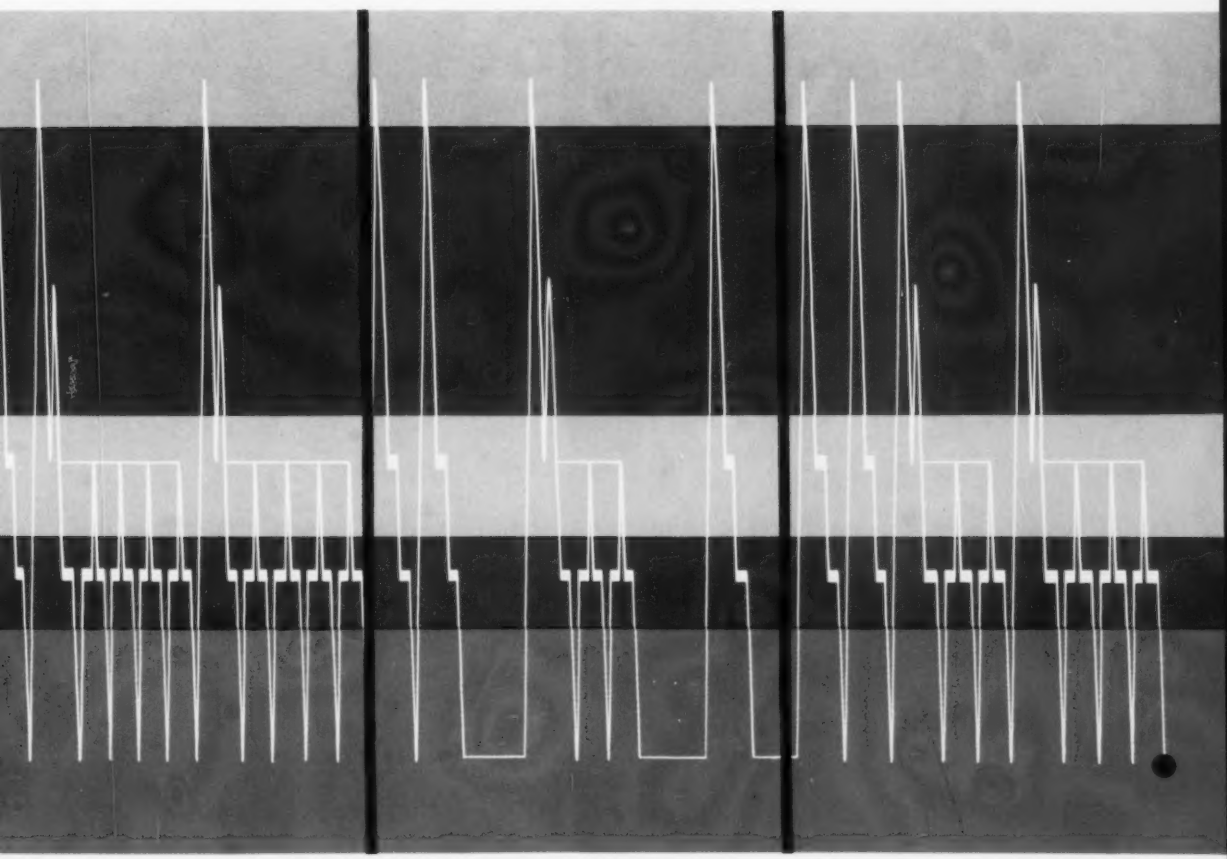

4 FULL CONTROL of an automatic steam plant requires simultaneous consideration of many sequences. To meet this demand, PRODAC-IV contains a priority director. This system, spread throughout the computer, selects programs to do the most important things first under all conditions.

received
PRODAC
startup t
equipmer
factory, l
trol main
normal, l
program
initiating
to the p
director
of the su
for the h
memory
quired to

Combi
only two
IV an e
plant au

Start
calls on e
fast resp
program
block is t
way, opti
the drum

ived from plant equipment and acted on by
)DAC-IV. At all times during the process, from
tup to shutdown, sensors monitor all participating
pment. During normal operation, if signals are satis-
ory, PRODAC-IV supervises plant process with con-
maintained by sub loop systems. If the signal is off
nal, however, the priority director selects the proper
gram of action from the combination memory —
ating this program immediately by returning signals
he process equipment. The PRODAC-IV priority
ctor also provides for storing the register contents
ne suspended program and bringing in the contents
the higher priority program. This feature saves both
nory space and programming time otherwise re-
ed to transfer back to the suspended program.
ombination memory and priority director — these are
two of the design features which make PRODAC-
an exact match for the entire problem of power
nt automation.



**tartup** Startup operations are critical. PRODAC-IV's priority director s on extremely high speed core memory for t response to changing conditions. If needed gram is not in the core, the required data ck is transferred from drum to core. In this , optimum use is made of bulk capacity of drum and rapid access of the core.

**Run** During normal operations, PRODAC-IV continuously monitors and checks plant performance. If no adjustments are needed, control is left at sub loop levels under supervision of computer. Periodically, set point adjustments are made to assure optimum operation. Should an emergency occur, priority director transfers to a corrective program.

**Shutdown** Upon initiation of shutdown, the proper programs are automatically transferred from drum to core. This combination memory system working in conjunction with the priority director makes PRODAC-IV more than equal to the problem of direct control of all participating equipment during this critical period.

Westinghouse

# Westinghouse understanding provides added benefits in design of computer-controlled equipment

Experienced Westinghouse people, backed by vast analytical facilities, are the key to complete compatibility of PRODAC-IV and automatic power plant control. Programming specialists serve as part of the same team to make sure that every detail of your performance specifications is met.

You can put this team to work now to help in preliminary planning, or to prepare a concrete proposal for any automated power plant facility under consideration. As an added benefit, system analyses made in the course of preparing plans and proposals will establish many of the required characteristics of the power plant equipment, itself. Further, it may be determined that rearrangement of the plant cycle will facilitate automation of the plant.

For fast action contact your Westinghouse representative, or write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa.

*You can be sure . . . if it's*

Westinghouse

File No. EU
CP-1062

Litho in U.S.A.

# NEWS

*Edited for the electrical industry of the West*

## Ceremonies Mark Start of Four Corners Plant

Ground was broken March 11 for a power plant that will open up the economic potentialities of a now barren corner of New Mexico's San Juan County. Arizona Public Service Co.'s $62 million Four Corners plant, now officially under construction, is located on the Navajo Indian reservation near Farmington, adjacent to 25,000 acres of undeveloped coal deposits.

The 350,000-kw plant will produce about half the power now being generated by Public Service, which has a peak load of 680,000 kw. It is scheduled for completion in the spring of 1963.

Utah Construction & Mining Co. will supply coal for the operation and has lease arrangements with the Navajos to provide 4,200 tons every 24 hours. Water will be pumped from the San Juan River five miles away and stored in a 1,200-acre lake.

Ebasco Services is general contractor for the plant. Utah Construction & Mining will build the foundation and the dam.

**Some 2,500 attended opening ceremonies at Four Corners plant site. Arizona Public Service President Walter Lucking applied the first shovel of dirt to a 30-ft flagpole. Watching are Paul Jones, chairman of the Navajo Tribal Council, left, and Allen D. Christensen, president of Utah Construction & Mining Co.**

## BPA Marketing Policy

Bonneville Administrator Charles F. Luce has shifted BPA organization to put the federal power agency back in the power promotion picture.

Principal change, effective March 15, was creation of a new division of power management. All functions relating to power marketing, resource planning and system operations are grouped in the new division.

Luce named Bernard Goldhammer acting power manager. He has been BPA's commercial operations officer.

The new division was given primary responsibility for increasing BPA's power sales to boost present revenues, expanding use of industrial power and to hold the line on BPA's rates.

"Bonneville Power Administration's reorganization seeks to create an action agency instead of a holding operation," Luce said. "BPA can and must play a vital role in power development of the Northwest as well as contribute to economic development to meet current and long-range needs of the region."

The reorganization also placed maintenance and plant service functions under the division of engineering headed by E. C. Starr, chief engineer. Area offices of BPA in Portland, Spokane and Seattle were made responsible directly to the administrator's office.

► The Perini Corp. of Boston, Mass., which has a **$10 million contract** for completion of Tacoma City Light's Mayfield Dam on the Cowlitz River, has filed an "extra work" claim for nearly $1,500,000 and has **asked a 40-week extension of its contract,** originally scheduled for completion in mid-1962. Both claims have been denied by the Public Utility Board but negotiations are expected to continue.

**NEWS INDEX**


| | |
|---|---|
| Associations | 62 |
| Communications | 46 |
| Growth | 47 |
| Manufacturers-Distributors | 99 |
| Market Development | 50 |
| Nuclear News | 43 |
| People | 53 |
| Washington Report | 42 |


## No Action on Power Bills

The regular session of the Washington state legislature adjourned March 10 without taking action on several bills of interest to the power industry. A special session, convened the same day, will be devoted largely to revenue matters.

Key power issue proved to be a bill that sought to prohibit PUDs from condemning facilities of investor-owned utilities without a public vote. This bill had a majority in early voting in the House of Representatives but finally was sent back to committee by a four-vote margin. (EWEST News Letter, March 15.)

Another measure, which would have prevented public power from invading areas served by investor-owned utilities and was strongly opposed by Seattle and Tacoma City Light, also died in committee.

The proposed Columbia Basin interstate compact, favored by investor-owned utilities but opposed by public power groups, failed of ratification. Sen. John L. Cooney, Spokane Democrat, said he would attempt to get an appropriation in the special session to permit the state to participate in developing a compact

acceptable to Washington and other states of the Pacific Northwest. Sen. John H. Happy, Spokane Republican, said he would oppose any such move, however. He has served on the compact commission for the past two years and said it was useless for the state to spend taxpayers' money on the compact.

Happy charged that the legislature is dominated by Ken Billington of the Washington PUD Assn. and Gus Norwood of the Northwest Public Power Assn., and that no compact would be acceptable to them.

## Rate Suit in Denver

A firm of lawyers filed suit in Denver District Court charging that Public Service Co. of Colorado had raised electric and gas rates "unlawfully and illegally" the past eight years.

The suit challenged the validity of a 1953 city charter amendment and a 1955 state constitution change that gave rate-making powers to the Colorado Public Utilities Commission.

The action asserts that the regulation of utility rates within Denver is under the control of city council as provided in a 20-year franchise granted Public Service Co. in 1947. The suit claimed that the franchise "is and at all times has been the only valid existing authority and basis for lawful rates to be charged for electrical and natural gas service."

## Water Situation Critical

Water conditions in most areas of California this year will be the most critical since 1931, according to William E. Warne, state director of water resources.

The situation is so bad, Warne said, "there is only about one chance in 25 that precipitation for the remainder of the year will be heavy enough to produce average runoff on a state-wide basis."

South of Sacramento, the chances for average runoff are much less. In the San Joaquin Valley, he said, there is a good chance that runoff this year will be comparable to that of 1924, the driest of record. Only in the upper Sacramento Valley and north coastal area will water supplies be anywhere near normal.

Warne warned that, unless precipitation for the remainder of the season (normally little rain falls after the latter part of May) is far above average, serious shortages of irrigation water may be expected throughout most of the state.

## Utilities Tell Plans For Colorado Distribution

Investor-owned utility officials told U. S. Bureau of Reclamation officials their plan to deliver Colorado River project energy to consumers was superior to an "all federal" transmission system.

D. L. Broussard, vice president of Utah Power & Light Co., said the federal and private utilities plans were reviewed during a two-day meeting at Salt Lake City with Frank Clinton, director of Region IV of the USBR. The meetings were closed sessions.

The utilities operating in five Western states told the bureau their proposal would: (1) deliver Colorado River project electric power to consumers at same rate as the federal transmission system; (2) save for the project some $136 million of capital investment in transmission lines; (3) repay costs of power facilities earlier than the federal system, thus bringing about earlier construction of needed irrigation projects to bring water to the land; (4) produce more money, in the long run, than the federal system toward repayment of irrigation projects.

"In addition to these benefits accruing to the project and the consumers in these five states, the transmission lines would be constructed by industry rather than by a public agency. This would generate tremendous tax benefits to the federal government, states, counties, cities and school districts," Broussard declared.

He said that over the total repayment period of the project these taxes would amount to almost $250 million. "Although local representatives of the bureau gave no indication that they were willing to accept our superior proposal, we are hopeful that the Secretary of Interior will reconsider his previous declaration to build federal transmission lines so that the people of Utah and surrounding states can benefit from the utility companies' proposal," Broussard said.

However, the following day Interior Secretary Udall said at Salt Lake City there was no possibility of any such reconsideration. He said he looked on the issues as an opportunity for federal power and private power to be developed in some sort of "partnership."

Funds for the power network have not been appropriated yet by Congress. Among those attending the meeting were George W. Groh, vice president, Arizona Public Service Co., Phoenix; M. C. Heffelman, vice president, Public Service Co. of New Mexico, Albuquerque, N. M.; L. R. Patterson, vice president, Public Service Co. of Colorado, Denver; Veryl Hoover, vice president and general manager for Wyoming of Pacific Power & Light Co., Casper, Wyo.

## Moratorium Protested

Secretary of Interior Stewart Udall's request that FPC declare a four-year moratorium on construction of major hydroelectric facilities in the middle Snake River area brought quick reaction from both parties in the High Mountain Sheep-Nez Perce controversy.

Subsquent action of Secretary Udall in withdrawing permission of Interior Department fishery experts to testify on fishery aspects of the rival applications of Pacific Northwest Power Co. and the Washington Public Power Supply System brought reaction from fishery interests. They appealed to Udall to rescind his order.

Kinsey M. Robinson, chairman of the board of Pacific Northwest Power, applicant for High Mountain Sheep, saw in Udall's moratorium request contradiction in national administration policy that is "a threat to Northwest construction jobs and orderly power development."

"In the first important decision affecting comprehensive development of the Columbia Basin's water resources, one arm of the new administration is recommending that the Northwest's biggest new power construction plan be stalled on dead center, while other spokesmen are urging the start of new projects to create needed jobs," Robinson said.

Robinson also said the proposed four-year fish study does not allow ample time to solve the very complex fish passage problem that would exist at Nez Perce. He pointed out that responsible fishery agencies say it would require 15 to 20 years to determine if the Salmon River migrants can be handled safely.

"Pacific Northwest Power has spent a substantial amount of time and money proving that High Mountain Sheep can be built immediately while keeping the Salmon River completely open for fish runs," Robinson said. "Meanwhile, study of the fishery problem on the Salmon River can be continued for as many years as necessary, be it four years or 20 years."

Washington Public Power Supply System, concerned also over the 1964

# Smogtypes need corrosion protection most!

Contaminated atmospheres are the "normal habitat" of Smogtype insulators.

It's an unhealthy environment. In areas of extremely severe contamination, even Smogtypes -- conventional Smogtypes, that is -- may not have what it takes to survive.

For a conventional Smogtype's only defense against the highly corrosive effects of contaminated atmospheres is the extra leakage distance afforded by longer porcelain petticoats. And sometimes, as the accompanying picture shows, extra leakage distance is not enough.

The Smogtype shown in the above illustration accomplished its intended purpose of protecting a 69-kv line from flashover (for a time), but it couldn't protect itself from the corrosive attacks on the pin which eventually destroyed it.

If you have to pay the 50% premium for Smogtypes in order to protect your lines from severe contamination, doesn't it make good sense to protect the *insulators themselves* from the corrosive effects of that contamination?

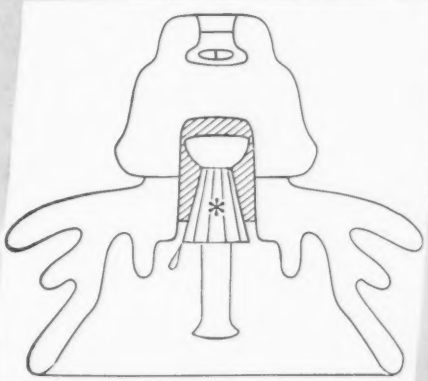
If contamination or corrosion is your problem, then Futura is -- or should be -- your insulator.

Why not talk it over with your O-B representative?

**OHIO BRASS COMPANY, MANSFIELD, OHIO**

**extra leakage distance is no substitute for protection of C. I. S.***

***CORROSION INTERCEPTING SLEEVE**



**Futura Smogtype With C.I.S.***

Futura's Corrosion Intercepting Sleeve (C.I.S.) protects against corrosion in two ways. Corrosion products normally deposited on the pin above the cement line, form instead on the yieldable metal sleeve, which gives slightly to eliminate bursting forces on the porcelain. Sleeve also tends to act as a drip shield, diverting moisture (and the corrosive salts dissolved in it) from their customary destructive path down the pin shank.

Ohio Brass

HOLAN

PORCELAIN INSULATORS • LINE HARDWARE • CAPACITORS • LIGHTNING ARRESTERS
BUSHINGS • HOLAN TRUCK MOUNTED POWER DEVICES AND BODIES • BRONZE VALVES

10083-H

KNOW YOUR SYMBOLS

This symbol stands for fusible switch

This symbol stands for QUALITY

THE SAFETY SWITCH THAT CHALLENGES COMPARISON!

# BullDog's heavy-duty safety switch!

- **Minimum arcing—double-break switching**
- **Arc control—Vacu-Break® principle**
- **Pressure contacts—Clampmatic® spring action**
- **Positive switching—direct handle operation**
- **High short-circuit performance—innumerable applications**

. . . Plus—all current-carrying parts are silvered. Available through 1200 amperes in NEMA 1 and NEMA 3R enclosures . . . competitively priced. Challenge our field representative to prove these switches are the finest . . . or write for details.

BullDog Electric Products Division, I-T-E Circuit Breaker Company, Box 177, Detroit 32, Michigan. In Canada: 80 Clayson Rd., Toronto, Ont. Export Division: 13 East 40th St., New York 16, N.Y.

*Consult the following Pacific Coast representatives:*

**Coast Electric & Manufacturing Co.**
1733 N. E. Seventh Ave., P. O. Box 7866
Portland 12, Oregon

**Young Electric & Mfg. Co.**
2134 Curtis St.
Denver 2, Colorado

**Safety Switchboard Company**
910-89th Avenue
Oakland 21, California

**BullDog Elec. Prod. Co. of Los Angeles**
3020 Supply Ave.
Los Angeles 22, California

I-T-E CIRCUIT BREAKER COMPANY
BULLDOG ELECTRIC PRODUCTS DIVISION

## A Salute to Linemen

*The important role that an alert, well-trained line crew plays in maintaining dependable electric service was brought to public attention in Portland General Electric Co.'s recent King Kilowatt contest.*

*Conducted in connection with National Electrical Week, the competition gave six four-man crews the chance to show their skills and how they are used to give customers constant service. Woven into the contest was information concerning the utility's apprenticeship and training programs.*

*Each crew—representing PGE divisions—had one-half hour. Three poles were set up to simulate actual working conditions and each crew changed a crossarm on the middle pole. The line was assumed to be "hot."*

*Judges awarded the prizes ($100 for each man on the winning crew) on a point system, taking into account general conduct and appearance of crew, truck and equipment; over-all teamwork and efficiency; general safety aspects of the job, including protection of crew members and the general public.*

*As an additional incentive, each division conducted a contest to name the line crew representing it. A $10 prize was given the author of the winning name.*

*Judges were L. W. Arnold, business representative, local 125, IBEW; Lee Murray, retired transmission maintenance superintendent for Bonneville Power Administration; and James Jump, electrical safety inspector for the Oregon state industrial accident commission.*

*Families, PGE employees and the public were invited to watch the competition, held near the utility's Portland Service Center. Believing it to be a first of its kind in utility promotion, the company expects to elaborate the idea in coming years.*

**Tualatin Valley Division's winning crew: front, Charles Bauer, foreman; Clarence Benge, lineman; back, Harley Clark, groundman; Burl Jarrell, truck driver. Chuck Bauer won the crown and sceptre (decorated hot-line stick) of King Kilowatt. This winning crew was featured in PGE advertising during National Electrical Week**

target date for solving the fish passage problem, was more optimistic than PNP that it would be solved sooner. Owen W. Hurd, managing director of WPPSS, said a letter from James K. Carr, Under Secretary of Interior, indicates clearly to WPPSS that the 1964 date "does not preclude an earlier solution to the problem.

"We are confident that the crash program of research and testing proposed by the Department of Interior will confirm the merits of our proposal for fish passage facilities at the Nez Perce project," Hurd stated.

## Morgan Appointment a Surprise

Appointment to the Federal Power Commission of Howard Morgan, Oregon public utilities commissioner during the 1957-58 administration of Democratic Gov. Robert Holmes caused some surprise in Oregon. Morgan was considered a more likely appointment to the Interstate Commerce Commission. Transportation economics has been his field of major interest.

In his term as public utilities commissioner, Morgan took several roundhouse swipes at both Pacific Power & Light and Idaho Power.

In 1958 he withheld PUC approval of an application by Idaho Power Co. to sell $20 million in securities to finance its Snake River projects. Officially, Oregon at that time was in favor of a high federal dam at Pleasant Valley, which would have inundated Idaho's Hells Canyon and Oxbow sites.

Although not an active participant in the National Hells Canyon Assn., Morgan favored the federal dam. He said, following his appointment, that he has no preconceptions on the Nez Perce vs High Mountain Sheep controversy now before the FPC. He said Nez Perce-High Mountain Sheep is "a much more complicated problem, involving several alternate dam locations, several rivers and the salmon problem. I don't think any responsible person could come to a decision on this without examining the record."

Morgan has been a force in Oregon Democratic politics since 1948. He is credited with being one of the authors of resurgence of the Democratic party in the state. He served in the legislature in 1949 and was later Democratic state chairman. He was one of a group of young liberals that included the late Sen. Richard L. Neuberger.

► **Reginald Carrier Price,** former Interior director of water and power, has been appointed deputy director (policy) for the California Department of Water Resources, which is undertaking a gigantic water development program. **William E. Warne,** state director of water resources, said Price will advise him on power and water development, project phasing, programming and marketing and on economic aspects of the state's water program. Price was director of the Interior Department's division of water and power from 1950 to 1953 at a time Warne was assistant secretary of Interior.

► **Seattle City Light received two awards** at the annual awards banquet of the Seattle Advertising Club March 3. A billboard promoting outdoor lighting with the message, "Plant this bulb in your garden," won a gold ribbon for reaching the finals in the billboard competition. A newspaper ad for the same subject received a blue ribbon.

► **Condemnation rights of electric utilities** would be restricted by a bill before the Oregon legislature. By its terms, condemnation rights for any transmission line would depend upon a finding of public interest and convenience by the state public utility commissioner, following hearing.

### Merger Approved

Near unanimous approval of the merger of the California Oregon Power Co. into Pacific Power & Light Co. was registered by stockholders of the two firms at special meetings held last month. Approvals must also be obtained from state regulatory authorities and the FPC before the merger can become effective.

### Press for Higher Wages

Los Angeles Water & Power commissioners were accused of acting illegally by the Civic Center Chapter of the Engineers & Architects Assn.

In a hearing before the Los Angeles city council water and power committee, E. E. Wachter Jr., representing some 800 employees of the civic center group, said the commission was violating the city charter by failing to pay engineers on a scale equivalent to that of industry. He claimed that engineers employed by private industry earn 34% more than those who work for the Department of Water & Power.

► **Linemen employed by five Washington PUDs** will receive wage increases of 12¢ an hour, retroactive to Jan. 1, under new contracts negotiated with IBEW Local 77. The Cowlitz, Grays Harbor, Lewis and Snohomish County PUDs bargained collectively for a one-year wage settlement based upon a $3.50 scale for journeymen linemen. Grant County PUD entered into a five-year contract, with a $3.51 scale for the first 13 months and automatic annual improvement factors of 8¢ in the next two years and 9¢ after that.

► The National Labor Relations Board has directed Rural Electric Co. Inc. of Pine Bluffs, Wyo., to **recognize and bargain collectively** with Local 415 of the Electrical Workers Union. The NLRB order climaxed a year-long dispute between the REA and the union. The utility was also told it must stop threatening employees with loss of jobs for engaging in union activity.

## WASHINGTON REPORT

### Udall Tells Power Policies

Interior Secretary Udall has enunciated his policies for power development during the next four years, and they generally lean toward public power development. "There is no doctrinaire note, no hostile note with regard to private power," he said, but "we're not running out searching for ways to let private industry have access to major hydroelectric sites" (as the Eisenhower administration advocated in its "partnership" policy).

Udall commented that he is "moving very gingerly" on plans for a nation-wide transmission system, and denied that he is thinking of such a system for the present time. He emphasized that interconnections between federal regional systems "might be handled on a common-carrier basis to the benefit of both public and private power." This idea is included in the proposed Bonneville-California intertie.

Chairman Wayne Aspinall (D-Colo.) of the House interior committee spanked Udall lightly for any attempts to "make policy" at the executive level. Aspinall fell back on an old congressional sore point, insisting that Congress makes policy, the executive branch only carries it out.

And Aspinall cautioned Udall that, in stepping up the Interior Department's activities as part of President Kennedy's "antirecession" program, no projects be planned that aren't true reclamation projects. Aspinall pointed to some cases in the past where the entire reclamation program has been held up to criticism because of a few projects that weren't justified as such, but had been built primarily as "make work" projects during previous economic slumps.

### Study Federal Tie Line

May 1 has been set as the deadline for a preliminary report on the feasibility of a federal high-voltage (500 kv) intertie between Bonneville Power Administration and California by Interior Secretary Stewart Udall.

Udall named new Bonneville Administrator Charles F. Luce to head a five-man committee to study the line, including Interior Assistant Secretary Kenneth Holum, Bonneville officials Morgan Dubrow and Bernard Goldhammer, Hugh P. Dugan, Sacramento regional director for the Bureau of Reclamation, and Milton A. Chase, engineering consultant to Holum.

The Kennedy administration is on record in favor of a high-voltage "common carrier" line between Bonneville and California, and this study reportedly is to be completed in time for funds to be included in the fiscal 1962 budget, to start work on clearing land for it.

The new committee is expected to draw heavily on the report made by Sol Schultz, manager of H. Zinder & Associates, for California Gov. "Pat" Brown. The department already has done considerable study on the line itself, partly to recommend, under the Eisenhower administration, the advantages of an alternate 230-kv line to be built immediately by Pacific Gas and Electric. That line, however, was fairly well blocked by the Senate interior committee.

Simultaneously, Udall approved the recommendation of the Bureau of Reclamation to build a federal power line (230 kv) from the Trinity Dam project to connect with the Central Valley system. This line – from Keswick to Tracy, Calif. – would be built for possible conversion to a 500-kv line as part of the proposed Bonneville-California intertie.

### Treaty Moves to Senate Floor

The Senate foreign relations committee gave a quick approval to the proposed U. S.-Canadian treaty for Columbia River development, moving the plan to the Senate floor for final ratification, and shifting the scene of ratification to Canada where British Columbia is delaying the situation until a study of power costs is completed.

One of the principle problems emphasized by the proposed treaty is that of obtaining a legal coordinate operations agreement among all parties in the Northwest Power Pool. Such an agreement is necessary – the treaty is based on it – to get full power benefit from the proposed 15.5 million acre-ft of storage in Canada's three proposed dams: Mica Creek, Duncan Lake, Arrow Lakes.

Another problem to be worked out in the coordinated operations plan is how to compensate dams on the Clark Fork River, Wash., which actually will lose some firm capacity as a result of the Canadian storage because of a shift in critical flow periods from 1936-37 and 1941-43.

This extends the water draw-down period for the Clark Fork River from seven to 20 months, with no added flows coming down from upstream to help the extended draw-down period.

The Northwest group is working both among its own members and with the federal government toward an agreement. Interior Secretary Udall appointed Bonneville Administrator Charles Luce to head a coordinating committee to work with the nonfederal systems. Final agreement probably is many months, if not years, away. However, time is not a critical factor, as first storage from the proposed Canadian dams won't come until the mid-1960s.

The treaty ratification is being pushed hard by the Kennedy administration, which wants to start work on Libby Dam, on the Kootenai River, as soon as possible.

## Hearings Moved to Portland

Federal Power Commission hearings on the rival Nez Perce-High Mountain Sheep hydro power projects shifted to Portland March 13 to hear testimony from 24 fish conservation witnesses. Hearings on all other phases of the conflicting license applications had been completed in Washington, D. C., in February; and final rebuttals will be presented in Washington on April 10.

Attorneys for Washington Public Power Supply System again petitioned the FPC for subpoenas against the commission's chief San Francisco engineer, Lesher Wing, and the FPC power bureau chief, Francis Adams, but for the second time FPC examiner William Levy and the full commission turned down the petition.

## Clapp Makes Policy Statement

Norman Clapp, new rural electrification administrator, issued a policy statement on taking office, including the point that "we will explore, in conjunction with other agencies of government and the electrical industry, the means and methods of interregional transmission ties so that surplus or secondary power of one area can be used in other areas of power shortage, and so that the benefits of low-cost hydro power are more widely shared by consumers generally."

Clapp also emphasized the need for more cooperative generating facilities. The Kennedy administration previously had called for more G&T loans.

►**Dr. Leland J. Haworth,** director of Brookhaven National Laboratory, has been named by President Kennedy as a member of the Atomic Energy Commission, filling the only remaining vacancy on the AEC. Haworth, a Republican, has a lifelong record of scientific achievement. He has been Brookhaven director since 1948, and is a past president of the American Nuclear Society, chairman of the panel on high energy accelerators, a member of the National Science Foundation. He studied in Indiana and Wisconsin universities; has taught at Wisconsin, Illinois and MIT.

## Pumped Storage Called Exciting New Field

Pumped storage for power generation has been called an "exciting new field" by Interior Assistant Secretary Kenneth Holum, and the whole area of pumped storage development is undergoing study in Washington.

A recent report by Administrator Douglas Wright of Southwestern Power Administration pointed out that up to 2.5 million kw of pumped storage power could be generated at existing or proposed reservoirs in his territory. Wright, naturally, would like to build all these facilities as federal projects.

Public Service Co. of Oklahoma, coincidentally, has asked the FPC for a license to build a 200,000-kw pumped storage project, using the water from Keystone reservoir, Okla., a Corps of Engineers reservoir without power. This is almost directly under Wright's nose in Tulsa.

House Interior Committee Chairman Wayne Aspinall (D-Colo.) and House Reclamation Subcommittee Chairman Walter Rogers (D-Tex.) have introduced identical bills to authorize the Secretary of the Interior to study pumped storage as a possible adjunct to Bureau of Reclamation projects.

The pumped storage concept could radically change the benefit-cost ratios at a number of borderline federal multipurpose projects. Its impact would be in areas where hydro is used as peaking power.

The Aspinall-Rogers bills call for Interior studies, incidentally, both into how federal laws might have to be changed to permit pumped storage facilities to be built and into what charges against nonfederal operators might be assessed for pumped storage projects built at federal reservoirs.

# NUCLEAR NEWS

## EEI Stand on Nuclear Energy

One hundred twenty-nine investor-owned electric utility companies are participating either singly or in groups in 25 separate nuclear power projects aimed at attaining economically competitive nuclear power. These projects range from research and study groups to operation of plants already producing power. These nuclear power development efforts involve expenditures of $700 million and represent some 2,000,000 kw of electric generating capability.

These and other facts about investor-owned electric utility companies' nuclear activities were disclosed March 1 before the Joint Congressional Committee on Atomic Energy by William J. Clapp, chairman of the Edison Electric Institute committee on atomic power.

Clapp testified that progress to date in the United States program of civilian nuclear power development has been substantial. Furthermore, a program that stresses research and development on a broad basis with construction consistent with research achievements is both proper and necessary for the attainment of both domestic and international objectives. Prototypes should be built, preferably by and on utility systems, to demonstrate the technical feasibility and economic merits of promising new reactor concepts or modifications. Large-scale reactors of any type should meet the test of substantial competitiveness.

Government's role in civilian nuclear power activities should be limited to the fostering of research and development and the investigation of promising reactor concepts. In fulfilling this role, government should use the services of the electric utility industry to the maximum extent possible.

Clapp's testimony in behalf of the EEI recommended that Section 44 of the Atomic Energy Act of 1954, which discriminates in the disposal of electric energy generated at government-owned experimental nuclear power facilities, should be amended and the preference clause in Section 182, which provides for preference consideration of license applications of public or cooperative bodies, should be deleted.

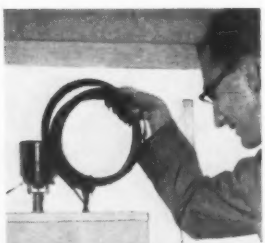
Investor-owned utilities in the West support EEI's position on nuclear power development and play an important role in this comprehensive program. One-eighth of the 129 companies are located in the

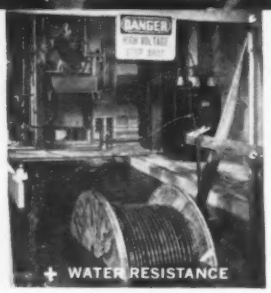
MOST NEOPRENE
THE BIG PLUS
IN
BRONCO Certified 66
NEOPRENE

PORTABLE ELECTRICAL CORDS AND CABLES

On top of all of the features you have ever asked for in a portable electrical cord or cable you get the most Neoprene in Bronco 66 Certified. This is your assurance that you will receive all the protection and service life a Neoprene jacket is capable of providing. Furthermore, you know what you are getting: a Registered Professional Engineer stakes his integrity and reputation on the Bronco 66 jacket by certifying—you'll find a registered certification on each and every carton and reel—that it contains not less than 67.32% Neoprene. You will also find the figures molded* into the jacket at exact two-foot intervals, "BRONCO 66 CERTIFIED —67.32% NEOPRENE" ...Why accept less?

*U. S. PATENT 2867001






The plus-value 67.32% Bronco 66 jacket is found on a complete line of portable electrical cords and cables—Types SO, W, G, Control, Welding, PG & PCG, W-P&R, and High Voltage 3KV & 5KV Types W, G, and SH.

BRONCO WESTERN
BRED FOR STAMINA

Bronco Wires and Cables are sold through Electrical Wholesale Distributors and are manufactured by

WESTERN INSULATED WIRE COMPANY
LOS ANGELES 58, CALIFORNIA

**Bronco Representatives in the West:**
**CALIFORNIA,** Western Insulated Wire Co., (Home Office) 2425 East 30th St., Los Angeles 58; Electrorep, Inc., 220 15th Street, San Francisco; **NEW MEXICO,** John Carder, Jr. Co., 1624 N. 1st St., Albuquerque; **OREGON,** George M. Roth, 1504 N. W. Johnson, Portland 9; **UTAH,** John Carder, Jr. Co., 1415 So. Main St., Salt Lake City; **WASHINGTON,** Jack H. Stumph, 1000 - 4th Ave., South, Seattle 4.


Western part of the country. These companies are associated with 40% of the industry's nuclear projects representing about 970,000 kw of nuclear generating capacity. This comparison shows how vitally interested these Western utilities are in the early development of economically competitive nuclear power.

## Los Angeles Plant Canceled

The Los Angeles Department of Water & Power notified the AEC that it is withdrawing its proposal for construction of a 50,000-kw improved cycle boiling water nuclear power plant and will concentrate its efforts on finding a suitable site for a larger plant. The Pasadena Municipal Light & Power Department, a partner in this venture, joined in this action.

This action came as a result of the rejection by the AEC of plans to use the proposed 50,000-kw plant site in Haskell Canyon, for larger units at a future date. This and unanticipated fuel and operating expenses would have increased the costs to these utilities by $7,000,000 annually.

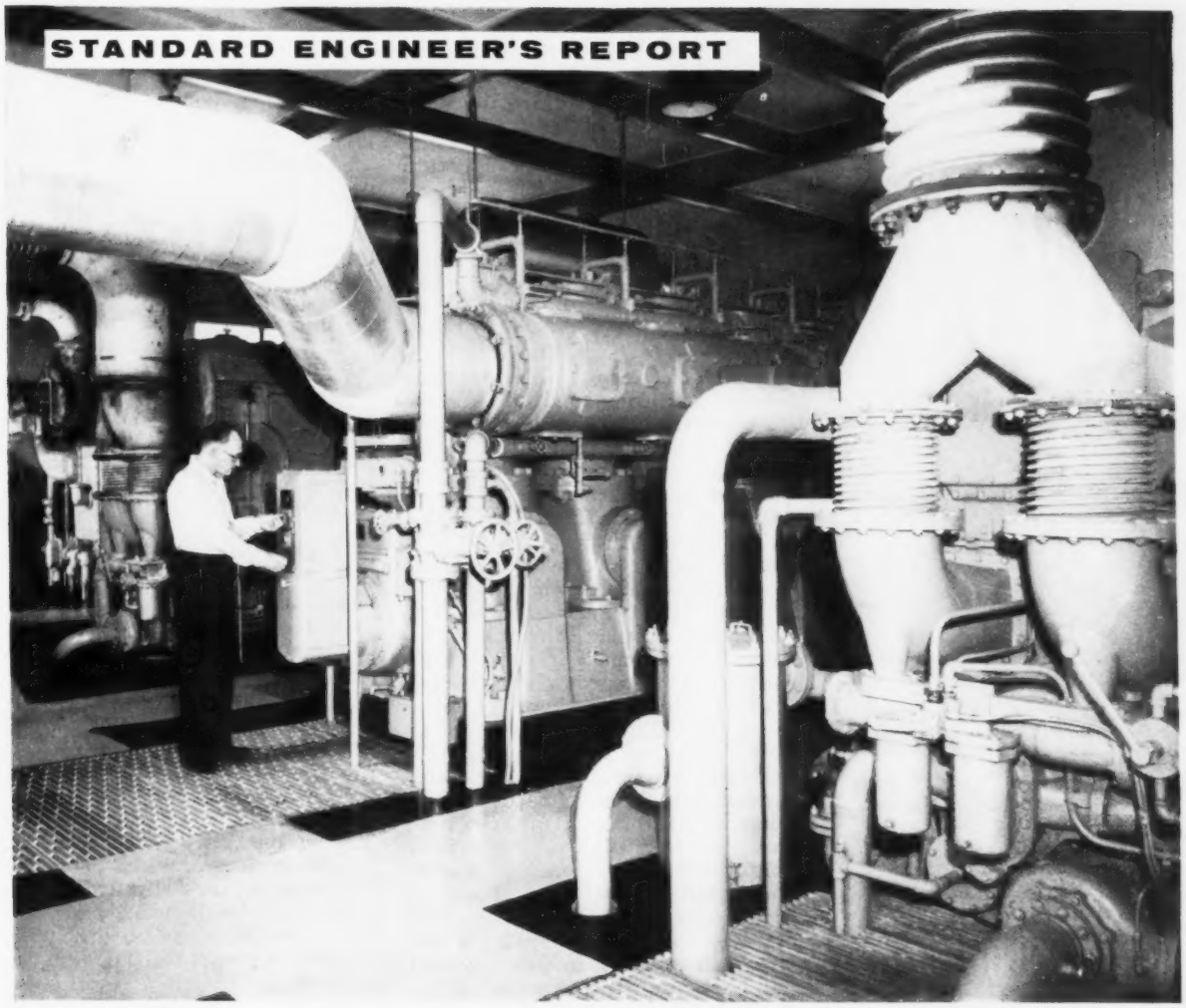
As a result of this action, the AEC has withdrawn the proposed basis for cooperative arrangements for this project from the Joint Committee on Atomic Energy.

The big loser in this action will be the Allis-Chalmers Mfg. Co., who was selected by the commission in November 1960 to supply the reactor for this plant.

## Westerners Interested In Organic Reactor Plans

The AEC announced that it has received nine expressions of interest from cooperatively and publicly owned utility organizations to participate in a nuclear power demonstration project incorporating a 50,000-ekw organic cooled and moderated power reactor. Two of the respondents are located in the West. These organizations are: Mineral County Power System, Hawthorne, Nev., and Plains Electric Generation & Transmission Cooperative Inc., Albuquerque, N. M.

Evaluation of the material as submitted has begun. An AEC invitation for formal proposals will be issued if upon completion of the evaluation—including a preliminary determination of acceptability, from a safeguards standpoint, of proposed reactor sites—it appears likely that a responsive proposal can be expected.




# Maintenance costs cut 60% using RPM DELO Oil

**The Municipal Power Plant,** West Bend, Iowa operates four diesel engines generating over 4 million hours of electric power a year. Since 1945, RPM DELO Oils have done an outstanding lubrication job . . . extended overhaul periods, and reduced maintenance costs by 60%.

**Plant Superintendent** N. P. Cuplin reports: "At the last major overhaul of our 1400 hp. Fairbanks Morse diesel, average wear on ten cylinder liners was only .007 after 4½ years of continuous operation. This is one third of normal wear. Interior parts were clean and unclogged.

**"We tried a number of other products** before we settled on RPM DELO Lubricating Oil. We've not only cut maintenance expense but have reduced fuel costs too, because RPM DELO's higher cleaning ability has allowed us to use a lower gravity diesel fuel oil."

**RPM DELO OIL reduces wear and prolongs engine life because it clings to parts whether engine is running or idle. An anti-oxidant fights gum and lacquer formation, special detergent keeps parts clean. Other additives prevent bearing corrosion, crankcase foaming.**

**Why not try RPM DELO Oil? Let it cut costs, lengthen equipment life. Contact your local representative or write 225 Bush St., San Francisco 20, California.**

LUBRICATING OILS RPM DELO

**STANDARD OIL COMPANY OF CALIFORNIA**

TRADEMARK "RPM DELO" AND CHEVRON DESIGN REG. U.S. PAT. OFF.

For Outstanding Quality...
SPECIFY

ETP
SET SCREW AND INDENTER E.M.T.
COUPLINGS & CONNECTORS
Only ETP has all these Quality Extras...
■ Sparkling Zinc Chromate Overplating
■ Concrete Tight, U.L. File Card E24788
■ Competitively Priced
■ One piece Solid Tubular Steel
■ Pre Set Deep Slotted Staked Screws — no backing out
■ Uniformly Concentric for Easiest Wiring
■ Extra Heavy Duty Locknuts
■ All Sizes up to 2"
WRITE TODAY FOR SAMPLES AND PRICE LIST
CONNECT WITH ETP FOR ECONOMY
Electrical Tubular Products, Inc.
74-16 GRAND AVE MASPETH (N.Y.C.) N.Y.
DEfender 5-8000

# COMMUNICATIONS

## Protests and Decisions

**The Telpak tariff of AT&T** has been approved by the FCC in spite of a petition by Motorola which, among other things, questioned whether the proposed charges were compensatory to AT&T or whether they were subsidized from other services in order to slow down the expansion of private microwave systems. In granting the tariff, the FCC indicated that the petition would be considered at least to some extent in the future.

The wide-area telephone service (WATS) tariff has been protested in part by the Independent Telephone Services who see no evidence that the Bell System was concerned as to whether or not it received compensation for interconnections.

And while we're discussing such relations, another interesting decision has been made in the scramble for frequency space. Last October AT&T filed for frequencies to be used in satellite communications research and, we suspect by no coincidence, it seemed to require this space right where some of the industrial microwave frequencies were assigned, particularly in the vicinity of 6,700 mc. Quite a deluge of comments fell on the FCC, and as a result it recently issued a fitting order to close the proposal—AT&T could make its experiments, but it would have to use the common carrier frequencies already assigned to it.

## Coherent Light Service

Progress on a **coherent light source** and a means of detecting it has been made by the Bell System lab. Modulated light beams have been used for many years to transmit various forms of intelligence including voice, and some have recently gained attention of the military in order to prevent interception of signals. However, coherent or single frequency light must be used in conjunction with suitable modulating and detecting equipment for the transmission of wide-band information or a hopeless jumble of modulation products will occur.

Compared to the frequency of radio waves, light is so much higher that it is possible to obtain fantastically wide bandwidths. In open air such a system would suffer from so much interference as to make it impractical for reliable service; however, if projected through a tube or other protective enclosure it would be capable of handling hundreds or perhaps thousands of times the number of circuits now in use on coaxial cables or microwave systems. Most promising means of detection appears to be with master techniques, which were developed for microwave use.

► Who is using the **radio alarm** feature of the Power Radio Service? A number of electric utilities in the West have obtained licenses for this feature, which allows them to tone modulate unattended base stations in the mobile service to indicate electric service outages, etc., but little actual use has been made of it. The city of Tacoma's Water Department has found it to be valuable for such purposes as critical reservoir levels, standpipe levels, low pipeline pressures, etc. Perhaps a lack of suitable equipment has been a factor. The recent broadening of the regulations to permit control by tones to restore service should start things rolling.

► **New FCC Chief** Newton R. Minnow took office early in March to fill the unexpired term of J. C. Doerfer until June when his seven-year term becomes effective. He is apparently well liked and well known as there was no dissent in the Senate's approval of the appointment. He has a legal background in Illinois and Wisconsin and has been interested in FCC matters. With such diverse things as common carrier tariffs, frequencies for space communications, frequencies for the military and defense, possibly even frequencies for the lowly Industrial Service, all hot on the griddle, he should have an interesting term.

► **Radio checks once a year** instead of every six months, says the FCC. This change in the regulations became effective March 1 and was not preceded by any announcement of proposed rule making. In making this change, the FCC explained that technical improvements in equipment had resulted in sufficiently stable performance to make this feasible. They by-passed the usual rule making procedures on the assumption that no licensee would object to an extension of the period. Users of transistorized equipment will now have an excellent opportunity to determine just how much less maintenance will be required.

## GROWTH

### Glen Canyon Equipment

Manufacturers of electrical equipment have been invited to bid on the fabrication and installation of the eight 112,500-kw generators for the Bureau of Reclamation's Glen Canyon power plant on the Colorado River storage project in northern Arizona. The 900,000-kw plant is under construction at the toe of the 710-ft-high concrete arch Glen Canyon Dam on the Colorado River, 12 river miles downstream from the Arizona-Utah state line.

The generators will be the largest in capacity to be installed on a reclamation project. They are to be rated as 125,000-kva, 90% pf, 150-rmp, 13,800-v, 60-cycle, hydraulic-turbine-driven, vertical-shaft, a-c generators. The total weight of each generator is estimated at 2,200,000 lb.

### SMUD's Camino

The first contract in the construction of the $6 million Camino power plant on Sacramento Municipal Utility District's upper American River project has been awarded.

The contract, calling for penstock foundation construction, went to the Western Knapp Engineering Co. of San Francisco on a low bid of $810,-175 and is scheduled for completion in September.

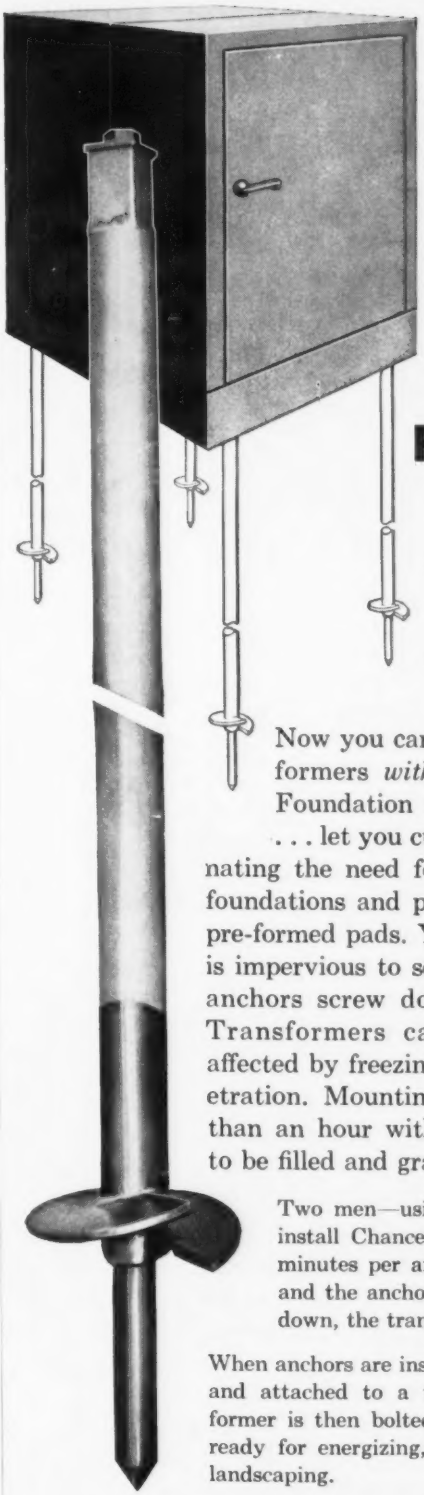
Installation of the penstock and construction of the power plant building and related work will go out for bid in May and by midsummer work on the plant itself will begin. The power plant's 75,000-kw generator is scheduled to go into operation in the spring of 1963. First power from the SMUD project, a 66,500-kw generating unit at Jaybird power plant, is scheduled to come on the line early this summer.

### BPA Speedup

A million-dollar speedup in Bonneville Power Administration's construction schedules has been ordered by Administrator Charles F. Luce to bolster employment in Oregon and Washington in March and April.

The accelerated projects were mostly scheduled to start in summer months. They include about $350,-000 of contract construction in Oregon and $500,000 in Washington.

Oregon projects scheduled for the speedup program include clearing and construction of the Cougar sta-

Complete mounting of "PAD-MOUNTED" TRANSFORMERS in less than an hour with

**CHANCE FOUNDATION ANCHORS**

- *No Concrete pads to pour or handle*
- *No Delays for grading*

Now you can install pad-mounted transformers *without concrete pads*. Chance Foundation Anchors make this possible . . . let you cut installation time by eliminating the need for special excavations, rock foundations and pouring concrete or handling pre-formed pads. You get a "foundation" that is impervious to seasonal changes because the anchors screw down below the frost level. Transformers can't move . . . they aren't affected by freezing, thawing, or moisture penetration. Mounting can be completed in less than an hour without waiting for the trench to be filled and graded.

Two men—using a square shank wrench—can install Chance Foundation Anchors in 8 to 10 minutes per anchor. Installation is permanent, and the anchor helix supports, as well as holds down, the transformer.

When anchors are installed, they are checked for level, and attached to a transformer bracket. The transformer is then bolted to the bracket, and the job is ready for energizing, trench-filling, final grading and landscaping.

*Write for a detailed bulletin that shows how Chance Anchors can help you save time in the installation of pad-mounted transformers.*

abc INDUSTRIES

**A. B. CHANCE COMPANY**

CENTRALIA, MISSOURI

(A. B. Chance Company of Canada, Ltd., Toronto)

CA61-6

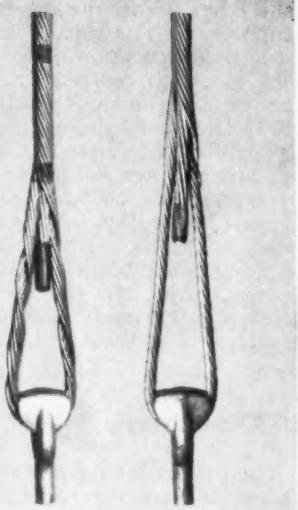
*For phone number of closest representative see advertising index in back of book.*

## *Best buy for dead-ending a guy...*

# FANNER Superformed* FANNGRIPS

COMPARE THE DIFFERENCES BEFORE YOU BUY HOLDING DEVICES

| | Fanngrips | Automatic Jaw Types | Bolted Clamps and Clips | Manually Moused or Served |
|---|---|---|---|---|
| **EXPERT INSTALLATIONS EASY** with little skill, no tools or dies | YES | YES | NO | NO |
| **NO-SLIP GRIP** even for highest loads | YES | ? | NO | NO |
| **STREAMLINED FLEXIBILITY** without excessive weight | YES | NO | NO | YES |
| **DURABILITY** at lowest cost | YES | NO | ? | ? |
| **SIMPLICITY** with highest strength, efficiency on EHS strands | YES | ? | NO | NO |
| **HIGH VIBRATION-FATIGUE RESISTANCE** | YES | NO | NO | YES |
| **RE-USABLE** with lasting efficiency | YES | ? | YES | NO |



**FANNGRIPS** are available with open-loop design (left) for flexibility and resilience upon impact, or closed twisted-loop in many sizes for compactness where space is scarce.

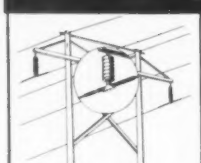
Fanngrips . . . time-proved, top-quality research/development products of Fanner, world's FIRST MAKER of machine-formed armor rods . . . provide the best available means for guying pole structures.

In addition to the cost-saving advantages shown above, Fanngrips are the only non-slip dead-ending device without biting, strand-weakening jaws.

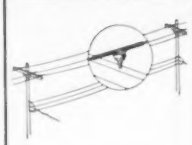
They provide maximum installation-safety, too. Wires are chamfered at ends, surfaces smooth. No burrs or jagged points to cut hands or snag gloves.

Available from stock for all sizes of galvanized steel, aluminum or copper-covered steel strands. They can also be supplied in other metals to match the strands they hold. Ask your Fanner representative for details, and for Bulletin FG-1 containing graphs for estimating savings in costs of guying materials.

A FEW FANNER Superforms AND FINEST PLASTIC PRODUCTS

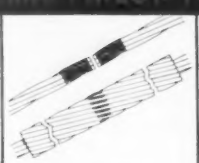


ARMOR RODS . . . Protect long spans at supports



LINEGUARDS . . . Protect short spans at supports

FANNGRIPS . . . For dead-ending strands or conductors



FANNSPLICES . . . For joining or patching strands

Plastic TREEGUARDS . . . Protect conductor surface covering

Plastic KOVER-GUARDS . . . Protect surface-mounted conductors

*A superior forming method in accordance with Patents No. 2,769,478 and 2,588,663—other patents applied for.

THE FANNER MANUFACTURING COMPANY
Brookside Park • Cleveland 9, Ohio

DIVISION OF TEXTRON, INC.

Fine Fanner Superformed Products

A-4025A

*For phone number of closest representative see advertising index in back of book.*

tion S, 115-kv transmission line in Lane County. Special maintenance jobs will include work on access bridges near Oregon City and Tillamook.

Washington projects include construction of the Tacoma-Covington 287-kv transmission line in Pierce and King Counties, the Ice Harbor-Franklin 115-kv line in Franklin and Walla Walla Counties, Scootenay substation additions, Ross substation building repair and Spokane area drainage system maintenance.

## Tillamook Project

The Federal Power Commission has issued a 24-month preliminary permit to the Tillamook People's Utility District of Tillamook, Ore., for a proposed hydroelectric project on the Trask River in Tillamook County, Ore.

The proposed project would consist of a dam about 150 ft high, a reservoir with a gross storage of 120,000 acre-ft, of which 100,000 acre-ft would be usable, a power house with an installation of about 30,000 kw and a reregulating dam and reservoir below the main dam with a maximum installation of about 5,000 kw.

Power generated at the proposed project would be used in Tillamook's system and for delivery to the Bonneville Power Administration.

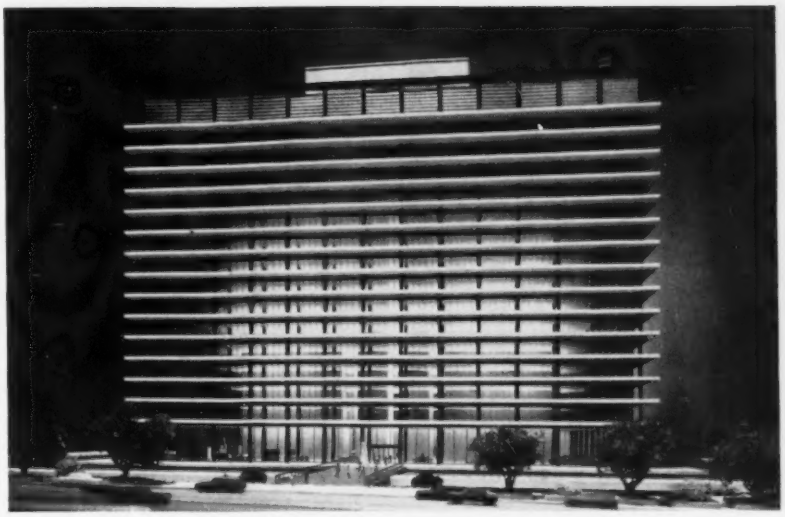
## Oregon Transmission

Plans to coordinate the building of transmission lines needed to integrate large blocks of new power allocated to Oregon from two major projects on the middle Columbia River with the hydroelectric systems of Portland General Electric and Pacific Power & Light companies were reported recently.

Construction of the 230,000-v circuits will provide a large-capacity interconnection between the Wanapum and Priest Rapids projects in eastern Washington and PP&L's plants on the upper Lewis River in southwest Washington and those of PGE in Oregon, company officials said.

PP&L and PGE will receive more than 1,000,000 kw of the output of the two major Columbia River developments, or nearly 60% of the total.

When Priest Rapids and Wanapum are in full operation, PP&L will be receiving 539,936 kw and Portland General Electric will be taking 469,198 kw into their systems under long-term contracts.



**Plans for the construction of the pictured new general office building for the Los Angeles Department of Water & Power were made public recently by commission President J. C. Moller Jr. The structure was designed by Albert C. Martin & Associates and will occupy a 16-acre site at the crest of the city's new Civic Center. Covering four city blocks, the new headquarters will form the Western terminus of the Civic Center Mall**

Field surveys and design work for the several sections of line and substations will begin promptly, it was reported. Construction is scheduled to start early next year.

Completion is expected by late summer of 1963, when Wanapum power will be available. Both companies already are receiving power from the first seven generators installed at Priest Rapids.

## REA Loan Approved

The Wyoming PSC has approved a federal REA loan of $351,000 for Shoshone River Power Inc. of Cody.

Proceeds from the loan will be used to construct 51½ miles of new single- and three-phase power lines to serve new consumers in an area near Mesteetse and Cody.

**Oregon will obtain large blocks of power (more than 1,000,000 kw) from two major Columbia River projects—Wanapum and Priest Rapids Dams—over high capacity 230-kv lines to be constructed by Portland General Electric and Pacific Power & Light**

# MARKET DEVELOPMENT

## How to Make a Profit Told at San Diego Bureau Meeting

Making a profit is the responsibility of management and not an economic happenstance, Jack D. Sparks, marketing vice president of the Whirlpool Corp., told the San Diego Bureau of Home Appliances' spring conference last month.

In good times and bad times, many appliance dealers in all parts of the country operate at a profit, he said. Some may be lucky, or have an ideal location, or a good organization, or be good traders by nature. "But when you take the group as a whole, you discover one characteristic that stands out above all others: the *successful dealer,* be he large or small, is a good manager of his business." And as a business grows, sound and progressive management becomes more and more important because it is necessary to delegate some of the work.

As Sparks sees it, a manager must assume four major responsibilities: planning, organizing, supervising and coordinating, controlling.

Sparks also believes that retail selling ability must be upgraded. The consumer of the not too distant future will know a lot more about the products she uses (one out of three will be college trained) and will expect more from retailing establishments, he pointed out.

Use imagination in selling was the advice of Tyler MacDonald, senior vice president and marketing director of Hixson & Jorgensen advertising agency. He brought it down to the "smart sell and the stupid sell" in an anlysis of the way appliances will be bought and sold in the future.

A look at the economic climate in San Diego was given by four speakers: Vice Admiral Clarence E. Ekstrom, commander, U. S. Naval Air Force Pacific; Ewart W. Goodwin, developer; Norman B. Foster, president, San Diego Chamber of Commerce; Robert F. Smith, executive manager, Convention and Tourist Bureau of San Diego.

**Tyler MacDonald of Hixson & Jorgensen talks with bureau president Tony Combs**

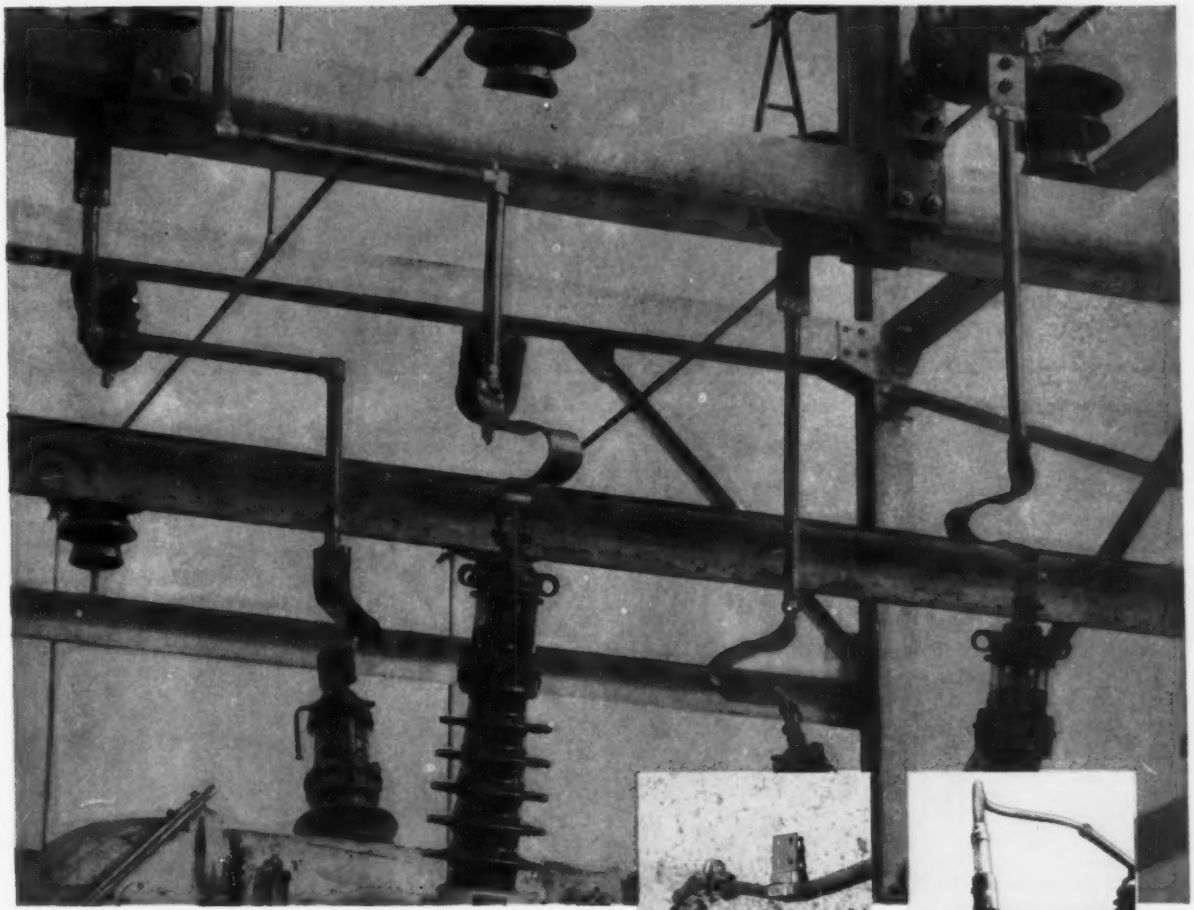
**GOLD MEDALLION APARTMENT: Being readied for "happy go 'lectric living" in June, the 120-unit Diplomat Apartments in Studio City, North Hollywood, will be the largest all-electric apartment building in the Los Angeles area. With a connected load of approximately 3,610 kw, the $2,000,000 building will have some $100,000 worth of electrical appliances. Electric wiring will cost about $130,000 and $30,000 will be spent for heating equipment. Another $20,000 will be spent on lighting. At the site with an artist's sketch of the $2 million project are Howard Goodman (left), Los Angeles Department of Water & Power, and Paul Price, North Hollywood, electrical contractor**

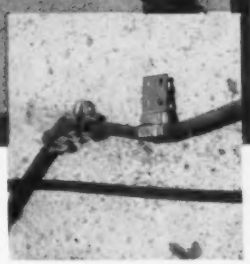
► **Hotpoint** has established three new sales zones on the West Coast with headquarters at Los Angeles, San Francisco and Seattle. Local sales operations for all commercial equipment department product lines will be handled through the zone managers. They are **William J. Gilcreast,** Los Angeles; **George Klopp,** San Francisco; and **Paul M. Markavage,** Seattle. **Jim Helwig** will continue to work out of the Los Angeles office as water cooler sales specialist for the metropolitan area.

► **A thermoelectric refrigerator-freezer** has been developed by Norge for the commercial field. Company spokesmen said that this unit could be the forerunner of a home refrigerator using thermoelectric materials to eliminate the mechanical compressor and refrigerant fluid required in conventional home refrigerators.

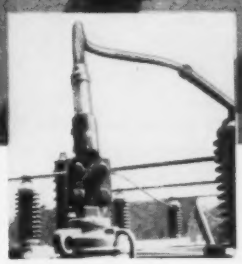
► Utah Power & Light Co. has renamed its Business and Development Department the Sales and Marketing Department. There's more to it than a change of name, however, Darcie H. White says. From now on the sales staff members will do more than just consult with customers. They will do that, yes, but they also will sell aggressively, emphasizing the slogan "Buy from your dealer." And they will follow the prospect until the sale is consummated.

# CADWELD





Lug tap off
strain bus cable



Tubing to cable
flexible joint

## moves into HIGH POWER CONNECTIONS

Utilities all across the country are utilizing CADWELD copper connections for their tubular bus and overhead strain bus cable. CADWELD having proved itself under the most severe current surge and corrosive conditions in copper and steel grounding systems, is now performing with the same economy and superior quality on overhead power connections.

Illustrated are standard connections of tube to: tube, lug (bus bar) and cable. Also shown in the main photo are CADWELD connections of tube to flexible, laminated, copper jumpers.

For further information contact your local CADWELD Distributor or write to: BUS TUBE % ERICO PRODUCTS, INC.

**CADWELD®** electrical connections

***Erico Products, Inc.***

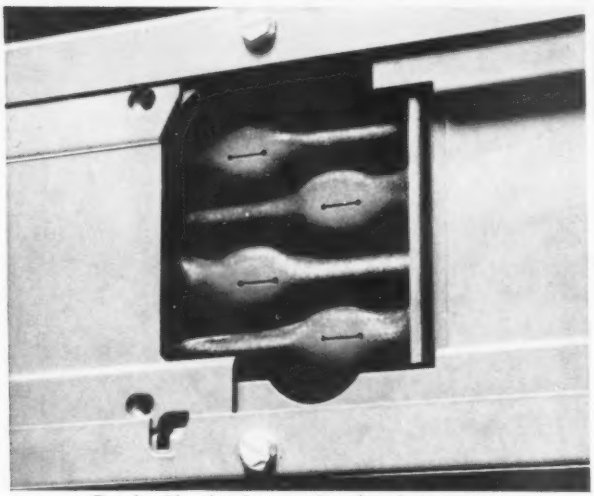
2070 E. 61st Place • Cleveland 3, Ohio

IN CANADA: ERICO INCORPORATED, 7 Superior Ave., Toronto 14, Ontario, Canada

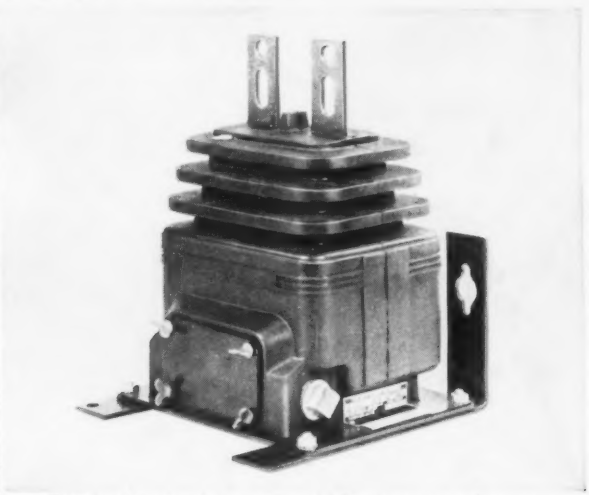
*For phone number of closest representative see advertising index in back of book.*

WHAT'S NEWS IN RUBBER

Butyl rubber insulates modern high-voltage transmission lines.



Butyl rubber insulates modern bus duct systems.



Butyl rubber insulates modern high-voltage transformers.

# ENJAY BUTYL

## best way to handle electricity

Enjay Butyl tops all vulcanizable rubbers in electrical and dielectric properties . . . in resistance to corona and ozone breakdown and water absorption. Its high dielectric strength insures against electric breakdown under normal or surge voltage. Its heat resistance permits higher current flow for a given conductor size. Butyl also offers outstanding resistance to weathering and sunlight . . . chemicals . . . abrasion, tear and flexing . . . superior damping properties ...unmatched impermeability to gases. Result? Butyl is ideal for wire and power cable, transformers, tapes, bus bars, and other insulation applications.

Find out how this versatile rubber can improve your product. Contact Enjay at 15 West 51st Street, New York 19, N. Y. Enjay does not make insulation. It supplies Butyl rubber to manufacturers of scores of different electrical products.

EXCITING NEW PRODUCTS THROUGH PETRO-CHEMISTRY

**ENJAY CHEMICAL COMPANY**

**A DIVISION OF HUMBLE OIL & REFINING COMPANY**

ENJAY® BUTYL

*For phone number of closest representative see advertising index in back of book.*

## PEOPLE

Tracy

Fletcher

### Top Management Changes at Sierra Pacific Power

Fred L. Fletcher, former executive vice president, has been made president of Sierra Pacific Power Co., succeeding Frank A. Tracy. Tracy, president since March 1942, has stepped up to the position of chairman of the board.

A native of Nevada, Fletcher began his utility career with Sierra Pacific 31 years ago, working summers while attending the University of Nevada. Following graduation, he worked for awhile with the Nevada State Highway Department, returning to the utility in 1935. He left Reno in 1941 to take a post with the Central Illinois Electric & Gas Co. at Rockford, Ill. He became president of that company in 1954 and resigned in May 1960 to rejoin Sierra Pacific as executive vice president.

Tracy, who has spent 41 years in the utility business, began with Stone & Webster in Boston. He went to Ponce Electric Co. in Puerto Rico in 1920 and in 1922 he joined the staff of the Blackstone Valley Gas & Electric Co. at Pawtucket, R. I. His career also includes two years as expert engineer analyst with the Securities & Exchange Commission in Washington, D. C. He joined Sierra Pacific Power as manager in March 1940.

► **Walter Hudson** of Torrington, Wyo., has been appointed by Acting Governor Jack R. Gage to another six-year term on the Wyoming Public Service Commission. He is the only Republican on the three-member commission.

► **Hobert P. O'Brien,** director of the utilities department of the Wyoming Public Service Commission, resigned at the end of February to take a higher paying position as accountant for the Laramie County Memorial Hospital in Cheyenne.

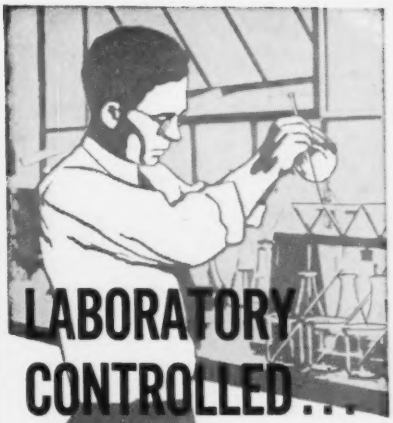
► **Edward M. Naughton,** president of Utah Power & Light Co., has been elected to the board of directors of ZCMI.

► **George E. Watkins,** a native of Utah and graduate engineer of the University of Utah, has been made director of the Edison Electric Institute's new research department. Watkins has been with EEI since 1951, serving as secretary of various committees.

► **Robert Paxton** retired as president of General Electric Co. late in February. In making the announcement, **Ralph J. Cordiner,** chairman of the board, said that his decision to retire before his long-intended goal of age 60 was precipitated by the need for a continuing period of convalescence following major surgery. Cordiner will act as chairman and president until a new president is elected by the board of directors. Cordiner announced at the same time that he was resigning as chairman of the Business Advisory Council so that he could devote his time solely to company affairs.

► **Clarence H. Linder,** vice president and group executive of G-E's Electric Utility Group, is acting as general manager of the company's Turbine Division until a successor is appointed to William S. Ginn.

Ginn resigned following his sentence in the anti-trust cases, saying he felt his usefulness had been severely limited.


GALVANIZED STEEL STRAND FOR GUY, MESSENGER and OVERHEAD GROUND WIRE

The high, uniform, consistently-dependable quality of Crapo Galvanized Steel Strand is the direct result of close laboratory control over each step in manufacture. All wires used in forming a particular size and grade are produced from steel of selected analysis, carefully processed under technical supervision and stranded on precision machines. Both wire and finished strand are subjected to prescribed laboratory tests to insure the desired end result.

**Heavy, uniform, tightly-bonded zinc coatings, applied by the famous *Crapo* Galvanizing Process, provide maximum resistance to corrosion.**

*Write for booklet OG-25 containing "Sag and Tension Data for Overhead Ground Wire."*

INDIANA
STEEL & WIRE CO., INC., Muncie, Indiana

Earl S. Condon
COMPANY
*Engineering Representatives*

- *Burndy Corporation* (U. I. DIVISION)
- *Collyer Insulated Wire Company*
- *Convair Instruments* (DIVISION OF GENERAL DYNAMICS)
- *Halex, Inc.*
- *Hughes Aircraft Company* (INDUSTRIAL SYSTEMS DIVISION)
- *Husky Products, Incorporated* (DIVISION OF BURNDY CORPORATION)
- *Kurz & Root* (COMMERCIAL DIVISION)
- *Lapp Insulator Co., Inc.*
- *Lotvan, Inc.*
- *Preformed Line Products*
- *Slater Electric Mfg. Co.*
- *Standard Elec. Products Co.*
- *Stromberg Carlson*

3450 Wilshire Blvd., Los Angeles 5, Calif.
Phone: DU 1-3951 • TWX: LA-795

► **Aldo J. Benedetti,** Tacoma water superintendent, was appointed acting director of the city's public utilities following the death of Director Dean Barline. In accepting the appointment, Benedetti made it clear he did not want the permanent directorship. The public utility board did not expect to make a permanent appointment to the $20,000-a-year post until late March.

► **A. R. Watson** has been elected president and general manager of Southwestern Public Service Co., having been elevated from the office of executive vice president and general manager. **J. E. Cunningham,** former president, was elected vice chairman of the board.

► **Jack T. Stiles** was appointed administrative assistant to Pacific Power & Light Co. President **D. R. McClung.** He succeeds **Harold H. Henninger,** who was appointed assistant general manager.

► Three Bonneville Power Administration employees received the Interior Department's Distinguished Service Award and Gold Medal as one of the last official acts of Secretary of Interior Fred A. Seaton. Those honored were **J. Lane Mortland,** assistant BPA administrator at Portland; **Jess J. Sitton,** plant services chief at Vancouver, Wash., and **Milton S. Sachs,** Berkeley, Calif., who retired as BPA chief hydrologist last year.

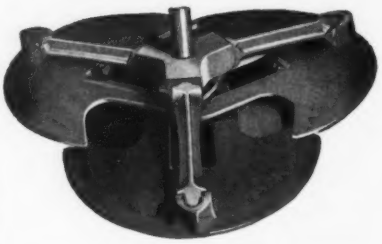
► **Henry H. Falkner,** Boise manager for Westinghouse Electric Supply Co., received the Westinghouse Citizenship Award in recognition of his outstanding contributions to community welfare. The award certificate was presented by **Walter J. Maytham,** Westinghouse vice president and Pacific Coast regional manager.

► **Edwin Nasberg,** hydraulic engineer for the USBR at Ephrata, Wash., has been transferred to Portland. He will serve on the technical staff of the Columbia Basin Interagency Committee on water management and power planning.

► **Mihills O. C. Kelson,** for 27 years with the federal government, has been made chief of the construction branch of the North Pacific Division, Corps of Engineers. His headquarters are in Portland.

► **Allen E. Rotta** has been made chief engineer of the Snohomish County PUD, succeeding **Donald F. Misz,** chief engineer since 1949. Ill-

**EXTRA Holding Power**
**QUICKLY Installed**
**TOUGH For long life**



**EVERSTICK ANCHORS**

**For new construction and maintenance — Everstick Anchors speed up work and provide dependable anchorage on all types of jobs. Made of resiliant, rust resistant malleable iron. The toughest anchors made. Write for bulletin.**

**EVERSTICK ANCHOR CO.**
**FAIRFIELD, IOWA**

**TO LOCATE WESTERN SUPPLIERS OF ELECTRICAL PRODUCTS**

***Look it up first in***

**ELECTRICAL WEST's BUYERS' GUIDE & MANUFACTURERS' DIRECTORY**—1961 Edition sent to all subscribers in November. Extra copies available $1.00 each. Write to Circulation Manager, Electrical West, 255 California St., San Francisco 11, Calif.

ness has forced Misz to reduce his responsibilities but he will continue as an engineering consultant. Rotta, manager of the Pacific County PUD at South Bend for 10 years, has also been with Puget Sound Power & Light, Seattle City Light and Clark County PUD.

► **Jack K. Horton,** president of Southern California Edison Co., has been named to the president's board of Pepperdine College at Los Angeles. The business and professional leaders on the board advise in planning the future of the college.

► **John Graham** has been appointed superintendent of Washington Water Power Co.'s Cabinet Gorge plant in northern Idaho, replacing Roy E. Furgason, retired. **Herbert Roehling,** former chief system operator at Noxon, takes over Graham's former post of superintendent there.

► **Wayne F. Bower,** executive assistant to the Portland U. S. Army District Engineer, has been named Federal Man of the Year by the Portland Federal Council composed of all federal agencies within the Portland area. He was selected from a group of nominees as having best served his community, his government and agency during the past year.

► **L. W. "Les" Dick,** a PP&L pioneer employee who remembers when 24-hour service was available only on ironing day, retired at the end of January. He had been Pacific Power's Yakima district manager for the past 17 years. He joined Pacific at Lewiston, Idaho, in 1913, three years after the utility was organized.

► **Voyle Eason** of Tacoma has been appointed chief of the supply division of the Portland District, U. S. Army Engineers. He succeeds **Lawrence W. Bixby** who retired at the end of the year after working for the Portland District more than 40 years.

► **Phil Rosser** has been promoted from local office manager to Northern division sales manager for Puget Sound Power & Light Co. He succeeds **G. L. McDonald,** who was transferred from Bellingham to become Central Division sales manager at Bellevue. **Bob Richards,** for 10 years local office manager at Poulsbo, has taken over as Bellingham local office manager. **Don Wirt,** formerly a commercial consultant in Bremerton, is the new Poulsbo manager.


## First in Performance Values

**SLOW DISK SPEED** (10 rpm at rated load) minimizes the effect of current damping on high loads and inherently requires less compensation to produce a more uniform registration curve.

**HIGHEST TORQUE** (from 10 to 100% above other meters) produces better stability . . . more uniform registration . . . more accurate light load performance. Especially helpful when demand registers, cyclometer registers or contacts are used.

**LOWEST LOSSES** (up to 10% less than other meters). While this loss is only 10 kwhr per year on a single meter . . . multiply by the total number of meters in service. The answer will surprise you!

**REFINED TEMPERATURE COMPENSATION** is an important element in meter performance. From —30°F. to +150°F., superior J3 temperature compensation gives almost perfect straight line accuracy.

**COMPARE** disk speed, torque, watts loss, temperature compensation. To these features, add the superior magnetic moving system. That's the J3, first in performance values.

**SANGAMO ELECTRIC COMPANY** / *SPRINGFIELD ILLINOIS*

*Unsurpassed in Metering Value...*

true *MAGNETIC* flotation

J3

## Changes at Montana Power

T. L. Doran, senior vice president in charge of operations, has retired from Montana Power Co. after a 47-year career that began as office boy. Cecil H. Kirk will succeed him as vice president in charge of operations. Kirk has been vice president in charge of electric operations.

A former Mines League baseball player and ex-legislator, Doran has lived in Montana for most of his life. He joined Montana Power in 1913 and has been with the company continuously since then except for time out for Army service in World War I. He was made vice president in 1950 and senior vice president in 1957.

Kirk joined Montana Power in 1922 and in 1925 took a leave of absence to study substation design with Southern California Edison Co. He returned to Montana Power as generating plant foreman and in 1930 was made distribution engineer for the Great Falls Division. Later he was named Great Falls city distribution superintendent and in 1940 he was transferred to Butte. He was made superintendent of transmission and distribution in 1949 and in 1957 was elected a vice president.

Other new assignments at Montana Power include four men who supervise engineering and purchasing activities. Ray M. Ball, chief engineer since 1954, will continue in that post with general supervision over all engineering but will concentrate on special projects and planning activities, such as future generation and transmission programs, engineering studies related to load and resource development, and area power coordination.

Carl R. Davis will be advanced from assistant manager to manager of the engineering department in charge of administrative and personnel activities.

Roger A. Hofacker, who has managed the purchasing department since 1957, will be assistant manager of the engineering department. Dan H. Pyfer, superintendent of distribution design in the engineering department, will succeed Hofacker as manager of the purchasing department.

► **Ralph M. Brody,** general manager and chief counsel of the Westlands Water District in Fresno, was appointed by Gov. Edmund G. Brown of California to succeed **James K. Carr** as a member of the California Water Commission. Brody resigned as deputy director of the State Department of Water Resources and special counsel to the governor on water problems Jan. 1 to take the Westlands job.

► **Alfred R. Golze,** former assistant commissioner of the Bureau of Reclamation, will move to California to take over a new position as chief engineer of the state's water development system. He has served the USBR in the Interior Department almost constantly since 1933.

## Sales Appointments

Puget Sound Power & Light Co. has announced appointments in its general commercial and sales department and a new sales manager in the Southern Division and a new local manager at Federal Way.

Orland G. Hunt has been promoted from sales manager for the Southern Division at Olympia to commercial and industrial sales director, with headquarters at Bellevue. His post at Olympia has been taken over by Donald R. Trafford, formerly Federal Way supervisor. Gene A. Andrews, sales consultant at Renton since 1959, succeeds Trafford.

Kennan E. Hollingsworth was named utilization engineer and William F. Heidergott contract supervisor in the general commercial and sales department. In the sales department since 1947, Hollingsworth will study the load characteristics of new electrical equipment and give information on technical advancements in lighting, heating and air conditioning. Heidergott had been local manager in Olympia since 1957 and has been with the company since 1936.

► **A. R. Teater,** Central Electric Co-op. of Redmond, was re-elected president of the Oregon Rural Electric Cooperative Assn. at the group's annual meeting in Eugene. Other officers are **Eric Reutercrona,** Coos-Curry Electric Co-op., Coquille, vice president, and **Bob Cole,** Harney Electric Co-op., Burns, treasurer.

► **Dan Webster,** Pacific Power & Light district manager in Corvallis, and **Stan Livingston,** PP&L Tillamook district manager, were named Senior First Citizens of their respective communities in January. **Sam Smith,** PP&L commercial-industrial salesman, was named Benton County's Junior First Citizen in Corvallis.

► **Rex W. Beeman** has been advanced to administrative assistant to Pacific Power's general manager, Albert W. Bauer. He had been a commercial-industrial sales engineer in the Portland district.

► **William G. "Bill" Walker** has been appointed assistant to Homer Beale, Oregon Division manager for Pacific Power & Light Co. Walker has been an industrial sales engineer in PP&L's industrial development department.

## Promotions at San Diego

Harold A. Noble has been promoted to senior vice president by directors of San Diego Gas & Electric Co. Joining the company in January 1925, as an engineer in the special construction department, Noble subsequently became assistant superintendent and superintendent of electrical production. He was named vice president for operations in 1951.

Announced at the same time was the elevation of three other officers to the vice presidency. J. F. Sinott was made vice president for engineering. Walter A. Zitlau was promoted to vice president for production and transmission. C. P. de Jonge was made vice president in charge of distribution. The three men previously had been managers of these activities.

► **John M. Adams** has been appointed Los Angeles regional manager for **Crouse-Hinds** Co. An electrical engineering graduate of Rutgers University, he joined the company in 1953 in its New York region. He was transferred to Los Angeles in January 1959.

Adams

► Addition to the **E. D. Bullard** Co. staff of **Harry E. Douglass** has been announced by E. W. Bullard Jr., vice president of sales, at the company's Sausalito, Calif., headquarters. With headquarters at 6719 S. Figueroa St., Los Angeles, Douglass will be district manager for southern California and Nevada. He was formerly vice president of the Stewart R. Browne Mfg. Co. in Los Angeles.

Douglass

► **Kuhlman Fluehr** has been appointed Western regional sales manager for **Kuhlman Electric** Co. with headquarters at Salinas, Calif. He is a grandson of the late George B. Fluehr, who supervised construction of the company's Salinas distribution transformer factory and managed it until his death last November. Kuhlman Fluehr has been on the Western sales staff for five years and before his promotion was Salinas manager.

Fluehr

► **Richard A. Hammond** has been transferred from **General Electric's** Cleveland District to San Francisco, where he succeeds O. A. Gustafson, as manager of G-E's Pacific Northwest installation and service engineering district. Gustafson had been with G-E for 37 years, 18 of them in San Francisco.

Hammond

► **Robert G. Petersen** is the new Pacific Area manager for **I-T-E Circuit Breaker** Co. The post is one of seven established by I-T-E in line with its division of the country into seven marketing areas, replacing the former four larger sales regions. Petersen joined I-T-E in 1952 and served as salesman and assistant district manager in New York and Philadelphia before being named Western regional manager in 1959. He was on leave from the company for a time during this period on loan to the Department of Commerce as business advisor. The new Pacific Area offices will be located in San Francisco.

Petersen

► **Richard C. Kelly,** construction and maintenance superintendent for Washington Water Power Co., retired Jan. 31 after nearly 48 years of service. Starting as a groundman in 1913, he had various assignments in the light and power section and in 1935 was named transmission maintenance engineer. In 1939 he was made transmission superintendent for the power supply department and in 1958 assumed the post of superintendent, construction and maintenance.

► **Robert B. Fulton** has been elected president of the **Sequoia Wire & Cable** Co., wholly owned subsidiary of Anaconda, with headquarters at Redwood City, Calif. He had been manager of the Orange, Calif., plant of Anaconda since 1958 and previously held supervisory and executive positions with the company in this country and Mexico. Other officers elected by the board of directors are **William L. Grey,** executive vice president; **James L. Vincent,** secretary-treasurer; and **Herbert B. Fields,** assistant secretary and treasurer.

Fulton

► **Charles E. Van Hoy** has been promoted to manager of **Anaconda's** Orange, Calif., mill. He comes from the Muskegon, Mich., plant, where he was assistant superintendent. The appointment fills the vacancy created when **Robert B. Fulton** was made president of Sequoia Wire & Cable Co., subsidiary of Anaconda.

Van Hoy

► **John William Hammond,** who began his career with **Appleton Electric** Co. as a field engineer in the Los Angeles area, has been made Northwest Region manager at Chicago.

► **H. E. Miller** of San Rafael has been named Pacific Regional Industrial Salesman of the Year by **Reynolds Metals** Co. The award is given annually to the salesman in the 13 Western states who turns in the best record based on a five-point system. A veteran of more than 20 years with Reynolds, Miller has been in sales only 18 months.

► **Marty Luskin,** for some years with Federal Pacific Electric Co. in the Los Angeles area, has become general manager of Inglewood Wholesale Electric Co., Inglewood.

► **Joseph R. Ray,** former general sales manager for **Curtis AllBrite Lighting,** has been made vice president in charge of sales . . . **Westinghouse** has elected **George L. Wilcox** as vice president and assistant to the president. He formerly was president of Canadian Westinghouse Co. . . . **Christopher T. Kastner** has been made manager of manufacturing at **G-E's** Power Transformer Department in Pittsfield. **George H. Hupman** is the new marketing manager at the same plant . . . **George F. Young** has been appointed **G-E's** marketing manager for the newly autonomous Bushing Products Section at Pittsfield, Mass. . . . **Ralph H. Earle,** who has served the electric power industry for 44 years, has retired as manager of engineering development for **Line Material.**

► **Thomas O. Nichols** has been appointed **Line Material** field engineer in the West Coast Region. He has taken over the territory formerly held by Earl Stites, who has been transferred to southern California as apparatus engineer for that territory. His headquarters are at 360 Shaw Road in South San Francisco.

Nichols

► **C. M. Salina** has been named manager of Hanford Works' electrical component which operates the atomic plant's electrical distribution system. An electrical engineer, he joined General Electric in 1947 and went to Hanford in 1948. G-E operates the plant for the Atomic Energy Commission.

Salina

► **Col. Paul Symbol,** Walla Walla District engineer for the U. S. Army Corps of Engineers, plans to retire in April after 21 years of service and will become associated with Bell & Valdez, Seattle home building and development firm.

► **Robert E. Blasen,** Westinghouse apparatus marketing manager at Spokane, received a 25-year service emblem from **Kendall L. Howe,** North Pacific District manager, during the company's recent meeting of managers in San Francisco.

# with a Truco 8000 lb. Center Mount Derrick

Never underestimate the power of a Truco turret derrick — especially the new compact Universal Center Mount Derrick. Here is a ruggedly built, all around utility tool that lifts, digs, puts a man in the air, sets a pole and installs the hardware. You mount it behind the cab of any standard line body in only 16" of space*. You get 360° rotation of the box-type steel telescoping booms from dual unitized controls. You lift up to 8000 pounds of payload with smooth hydraulic operation while twin hydraulic outriggers keep your vehicle Gibraltar steady.

You'll be able to dig those holes that just couldn't be dug before, too. Truco's new 4-speed hydraulic digger has three conventional speeds plus a brand new super low speed for biting through shale, caliche and hardpan — even anchor holes are possible with ease at *any* angle, in *any* direction. For aerial lift use, add a fiberglass safety basket with airplane-type single stick control.

Before you buy, insist on seeing this multi purpose utility tool in action. Investigate the savings *you* can make on *your* utility jobs — in dollars, manpower and time. See your Truco dealer or write for details.

**Also available for corner mount installations.*

**TRUCK EQUIPMENT COMPANY**

*"The COMPLETE Line of Utility Equipment"*

3963 Walnut Street / AC 2-7905 / Denver 5, Colorado

## Deaths

► **William M. Jewell,** Western region manager for National Association of Electrical Distributors since 1953, died from a heart attack, March 13 in San Francisco, aged 66 years. Mr. Jewell, prior to his NAED position, had been with Westinghouse Electric Supply Co. and was branch manager in San Francisco for two years, leaving in 1942 to go to Detroit. He returned to the coast at Seattle in 1943 and was branch manager there until he retired in 1953.

► **Elmo Neil Murphy,** with Pacific Gas and Electric Co. from 1920 until his retirement in 1953, died in San Francisco. He specialized in design of hydro projects and was instrumental in review of the designs of the existing company dams when all major dams in California were placed under state supervision.

► **Archie R. Matson,** for some 50 years one of the Oakland area's principal electrical contractors, owner of Matson Electric Co., and years ago a partner in the Matson & Seabrook Electric Co., died while undergoing a hospital health checkup. In his 70s, he was active until his death.

► **C. B. "Cap" Kenney,** retired pioneer electrical contractor of the San Francisco Bay area and Northwest, died recently in a hospital in Oakland following several months hospitalization after a stroke and fall. Mr. Kenney from the days of the San Francisco fire was the California manager of the NePage-McKenny Co. of Seattle and Portland. He closed the California operation in the 1940s and has been living in Claremont in retirement. He was at one time president of the San Francisco Electrical Contractors Assn. and of San Francisco Electric Club.

► **James S. Addis,** retired vice-president of Gough Industries Inc., Los Angeles, and active in Los Angeles electrical circles until 1956, died early this year.

► **Roy Eric Lindblom,** 62, professor of electrical engineering at the University of Washington, died recently following a heart attack. On the faculty since 1924, he assisted in the design of the university's electrical engineering building and supervised installation of the building's equipment.

► **Walter William Mohrdick,** 66, an electrical contractor in San Fran-

cisco since 1921, died at sea Jan. 5 on a trip to Rio de Janeiro with his wife. He founded the Mohrdick Electric Co. in 1921 and in recent years his two sons, Walter William Jr. and Robert, have been running the business, located in San Francisco. Mr. Mohrdick was a member of San Francisco Electrical Contractors Assn. and the IES.

► **Carl C. Severin,** 74, colorful old-timer in the San Francisco Electrical Contractors Assn., one time its president during the International Exposition years 1939-40, died recently. In earlier days Mr. Severin was active on many large construction projects in northern California, was an honorary member for 50 years of IBEW Local 6, which provided an honor guard of some 40 of its members for his funeral.

► **William D. Coburn** of Linnco Electric Co., Albany, Ore., died recently in Albany. He had been a member of the Oregon-Columbia Chapter, NECA, since 1951 and active in industry affairs.

► **Gordon Prentice,** 75, president of Sunset Electric Co. of Seattle, died recently in Palm Springs, Calif., where he had been vacationing. He founded the company in 1915 and had been president since.

► **Carl Russell,** 61, electrical engineer for Pacific Power & Light Co., died at the U. S. Veterans Hospital in Portland on Feb. 2 after a long illness. Before naval service in World War II, he was for 20 years with Portland General Electric Co. He was a veteran also of World War I.

► **James B. Agnew,** one-time president of the Los Angeles Board of Water & Power Commissioners, died recently at age 81. He served as a commissioner from October 1939 to August 1944.

► **Herald N. Cole,** 66, who retired in 1959 as credit and collections supervisor for Tacoma City Light, died recently. He had been with the department for 32 years.

► **Barry Dibble,** 79, consulting engineer, died in January at Redlands, Calif. He was with the USBR from 1909 to 1924, supervised studies for Grand Coulee Dam and participated in planning Hoover Dam. He was chief electrical and mechanical engineer for the bureau's Denver office, when he resigned and moved to Redlands as a consulting engineer.

**WHAT A DIFFERENCE!**

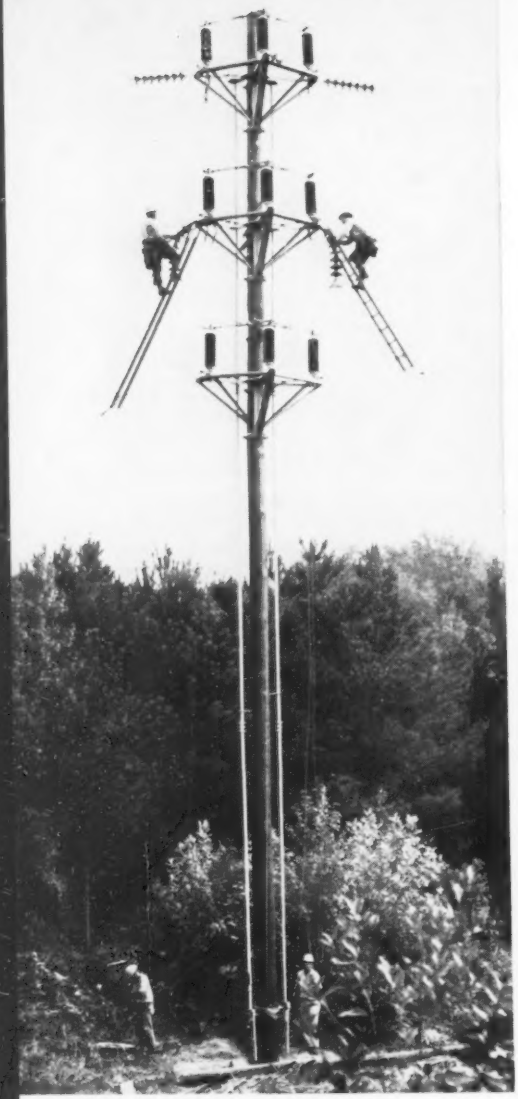
**What a beautiful difference P & K ALL-ALUMINUM LIGHTING STANDARDS can make in any community**

You're looking down Broadway, the main business street of Needles, California. Ordered by the City Council as part of a relighting program, the installation, made by the California-Pacific Utilities Co., consisted of twenty seven P & K 30 foot tapered aluminum lighting standards. As you can see from the photos above, the difference is immediately apparent. The result is greater safety for the community at night and the beautiful modern appearance of the new standards by day. Of course, no painting ever required. Why not write for P & K's new brochure ALS-5 for a wealth of helpful information in your street lighting plans.

**P&K**

**PFAFF & KENDALL**
**84 Foundry Street, Newark 5, N. J.**

*Branch Sales Office: San Jose, California*
*In Canada: Powerlite Devices LTD., Toronto, Montreal, Vancouver*
*Export Representative: Philips Export Co., N. Y., N. Y.*



MINIMUM CREW TIME is needed to install Southern States Pole-Pak Air Switches. One pole is all that's needed for three-way switching, compared with conventional arrangements requiring up to six poles. Limited land requirements offer opportunities for installations where other types are not possible. Savings can be substantial.

# EXCLUSIVE MOUNTING SYSTEM SPEEDS ERECTION OF SOUTHERN STATES' POLE-PAK

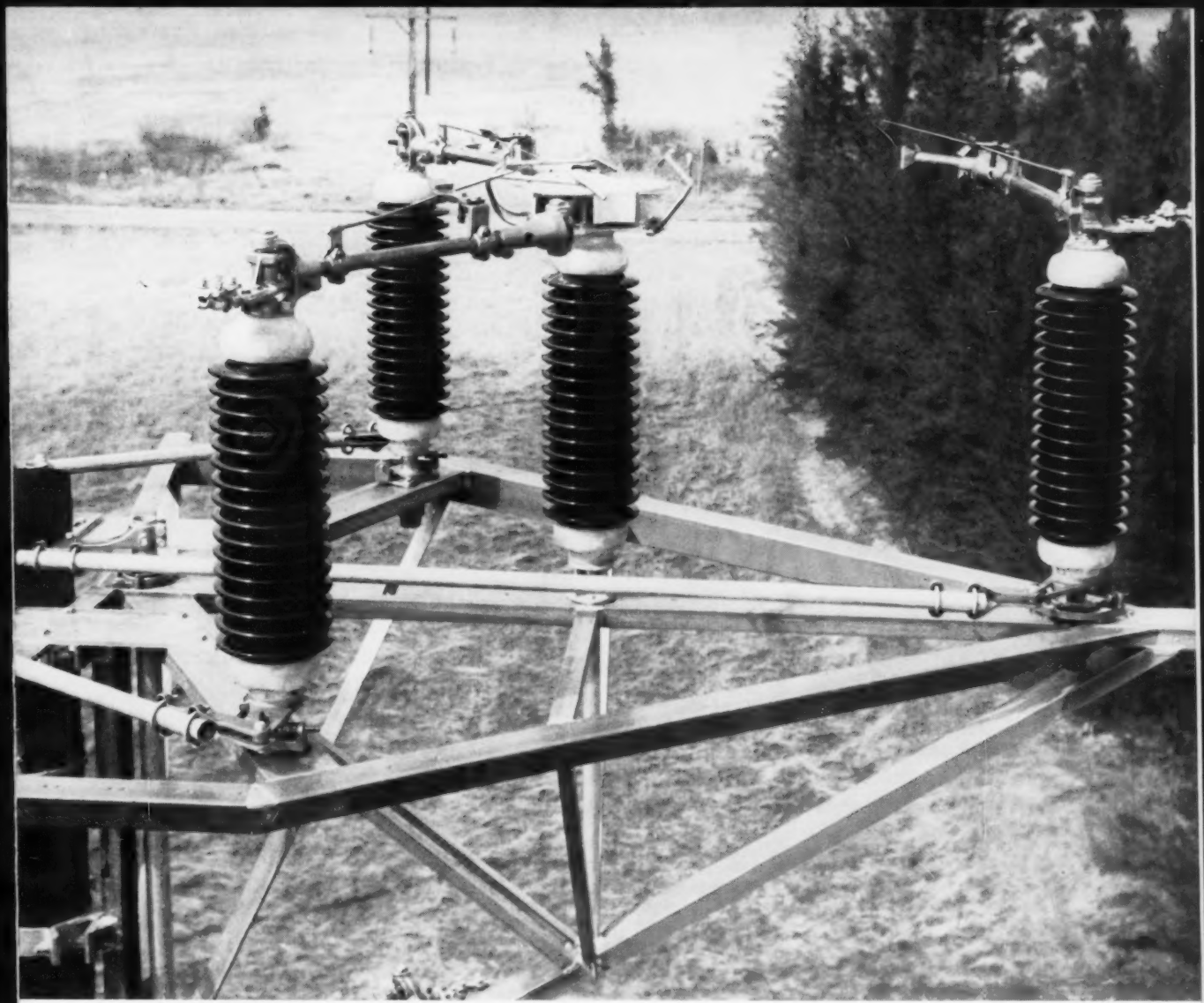
There are many outstanding mechanical and operating features of Southern States Pole-Pak phase-over-phase air switches. But the speed and ease of installation are particularly outstanding advantages.

Southern States employs an exclusive, simplified mounting system. Clamp-type steel bands are fastened to the pole at pre-determined positions. No gaining or drilling is necessary, assuring longer pole life. All switch units are assembled on the ground and hoisted into position. Hooks on the switch frame slip over a mounting plate on the top band, providing temporary suspension and automatically lining up mounting holes for quick and easy permanent bolting. It's that simple!

### Other Pole-Pak Features

The Pole-Pak uses Southern States Type 57L braidless air switches. These rugged switches are equipped with Amplitact® contacts, time-proved as the most dependable means devised for handling high short currents.

The Southern States 57L switch is unusually easy to operate. Its blade is designed to toggle into the closed position and has no tendency to open. No force from the operating mechanism is needed to keep the switch closed. The switch is easily oper-



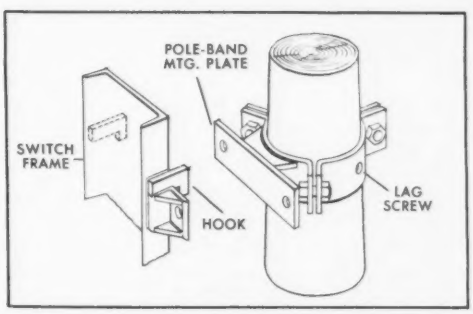
SOUTHERN STATES POLE-PAK is available in voltage ratings from 7.2 kv through 69 kv and continuous current ratings of 600 and 1200 amperes. One- two- or three-way models are available. Southern States Type 57L side-break braidless air switches with Amplitact® contacts are used in the Pole-Pak.

ated by one man, even under icing conditions.

The Pole-Pak frame is constructed of 6061-T6 structural aluminum with adequate bracing for vertical angular pulls in addition to line tensions.

This phase-over-phase method of switching, employing only one pole, with its many time-saving and cost-saving advantages, warrants careful consideration.

Get full information from your Southern States representative, or write for Bulletin 61 PP.




SIMPLIFIED MOUNTING results from exclusive system. Steel band is clamped to pole. Two lag screws prevent slipping. Hooks on switch frame slip over pole-band mounting plate. No drilling or gaining of pole is necessary.

SOUTHERN STATES
HAMPTON, GEORGIA

IN CANADA: DOMINION CUTOUT CO., LTD., TORONTO

## ASSOCIATION AFFAIRS

SRVEA officers: Maurice Saville, president; Walter Wallich, treasurer; Al Gilbert, past president; James Bruce, secretary; John Jackson, vice president

Don Gaved presents award to G. A. Arnold

### Sixth SRVEA Annual Conference in Boise Tops Them All

Six years of notable growth in the importance of the Snake River Valley Electrical Assn. as the industry's strongest promotional force were reviewed by President Al S. Gilbert of Idaho Power Co. in welcoming the Edison's Birthday annual conference in Boise. The conference drew some 95 members from all branches of the industry from southern and eastern Idaho for the one-day session and banquet, with nearly 200 at the joint luncheon with the Boise Chamber of Commerce.

Joe I. Wright, Afton-Lemp Co., past president, was conference chairman.

Gilbert recalled the rebirth of the association at the beginning of the Live Better Electrically program and its participation in it, the Housepower and Medallion Home programs with great success. Most significant news was that more than 800 homes are now heated electrically in the SRVEA area due to the active promotion of all branches of the industry. He predicted that eventually all homes would be electrically heated. Enumerating the various unsold markets, such as home lighting and rewiring, he said that sales would not be accomplished by dealer competing with dealer, contractor underbidding his fellow contractor, but by working together to sell the full electrical complement to the home.

The program was well coordinated to follow up on Gilbert's theme. Dr. Donald E. Walker, president of Idaho State College, Pocatello, discussed in "Customers Are People" the fundamental human responses and the changed circumstances of living which make advertising important as a means of reaching and convincing the public. William A. Cyr, consulting editor, ELECTRICAL WEST, and representative of Biddle Trade Publishing, followed with the practical side of advertising for the small contractor, dealer and repair shop. Showing that, although the small business could not hope to compete with the big massive advertising, it could ride on its coattails and derive a benefit from it by identifying itself to the public as the place and person from whom to obtain the service or product announced in the ads.

A feature for years of the SRVEA conferences has always been the outstanding sales promotion type of speaker at the noon luncheon. To this the business community through the chamber of commerce is invited to attend. This year's speaker was Millard Bennett, an associate of Dr. Norman Vincent Peale in sales forums, who spoke on "Power of Inspired Salesmanship." Predicting an upturn in business within six months despite the administration's taking business further down the road to Socialism, Bennett declared that the public does not realize that the American way of life is the result of salesmanship. He said there were no limits to the needs of the people but that these needs would never be satisfied by government and that it required salesmanship to move the productivity of private business enterprise to the users.

At the afternoon session Robert J. O'Connor, Central Division sales manager of Idaho Power, related his surprise in surveying people in all phases of the electrical industry as to their attitudes toward electric heating. He quoted some of the discouraging comments that he received, indicating distrust of electric heat, which could not but reflect in doubt to the customer.

O'Connor pointed out that the wiring job on an average home of 1,400 sq ft in the $19,000 price range would be around $450; with electric heat $600; and as a Gold Medallion some $690, to which would be added more lighting fixtures and appliances. The total industry's share from the average home would be $850 as against $1,910 for the Gold Medallion Home, an increase of over $1,000 per home. With some 2,000 new home starts in the Snake River Valley in 1961, this would represent over $2 million additional to the industry.

He continued that commercial buildings were excellent prospects and cited the state highway department building and several schools now heated electrically. Seeing the trend toward electric heat, he said the sheet metal and plumbing and heating industries are moving into the field which the electrical industry should be selling.

President Tom E. Roach of Idaho Power Co. summed up the business opportunities for the entire region in the industrial development based on utilization of its agricultural products and the processing of those products rather than shipping them merely as raw materials from the state. The role of the utility in providing adequate power for this industrial growth showed very clearly.

Paul Worthen, General Electric Co., program chairman, recapitulated the entire program and showed the relationship of the various parts. Awards were then made to the winners in the three chapters.

Mel Jensen, Magic Valley Chapter at Twin Falls, presented awards for retail appliance salesmen in order of their winning, to Elvis Cain, Nolan Simpson, David C. Ashby, M. H. Jensen, Lloyd Hains and James Ruge. The Appliance and Electric Service Award went to R. C. Adamson, and both the Residential Electrical Contractor and Commercial Contractor Awards went to Frank Hinrichs of Rupert.

In the Eastern Chapter, Don Gaved, chairman, presented retail awards to William A. Liday, John Holt, Norman Hansen, Ray Harmon, Frank Ramey and Al Vigliaturo. The Residential Contractor Award went to Ronald Scott, Repair Service to G. A. Arnold, Contractor Award M. J. Millward.

In the Central Chapter around Boise Ray Spencer, chairman, presented retail awards to L. S. Zbrowski, Lloyd Leath, Dick Olson, Cassell Pickens, Clarence Mueller and A. N. Muhlstein. The Electrical Contractor Residential Award went to Lysle Keith, Commercial Contractor to Pat Powell and Bill Stith.

Elected to office for the new year were Maurice M. Saville, G-E Supply Co., Boise, president; John Jackson, Mountain Electric Co., Pocatello, vice president; James E. Bruce, Idaho Power, secretary; Walter Wallich, Gem State Electric, treasurer. Chapter presidents elected were Doren Parr, Pocatello, Eastern; James Ruge, Twin Falls, Magic Valley; Don Byrne, Boise, Central. On the directorship, representing contractors, Richard M. Alloway and Ward Hall, Pocatello; utilities, W. R. Reed and Fred Cochrane; manufacturers, Paul Worthen, G-E, and Joseph Devine, Westinghouse; retailers, N. A. Spofford, Jerome, and John Jackson, Pocatello; electronics, Irving Higgins and W. L. Reiher, Twin Falls; appliance repair, Gervase Arnold, Pocatello, and R. C. Adamson; distributors, M. M. Saville, G-E Supply, W. E. Taylor, Strevell Paterson Co.

**Marshall Brinton and David B. Brinton, co-owners of Brinton Electric in Murray, Utah, receive trophy awarded to firm who had contributed most to IEA during 1960, from immediate past president, Walter J. Michelsen, Intermountain Electrical Association**

## Intermountain Association Conference Features Medallion Panel

"This Is a good Business" was the banner under which the Intermountain Electrical Assn. rode to a successful pre-National Electrical Week annual conference at Ogden Feb. 2 attended by some 150 representatives from all branches of the industry in Utah and eastern Idaho. W. A. Huckins Jr., conference chairman, had arranged a strong selling program of speakers for the morning session and a Live Better Electrically program panel session for the afternoon. The noon luncheon was made the occasion of installation of new officers by Past President Walter J. Michelsen, Westward Distributing Co., and the presentation of awards.

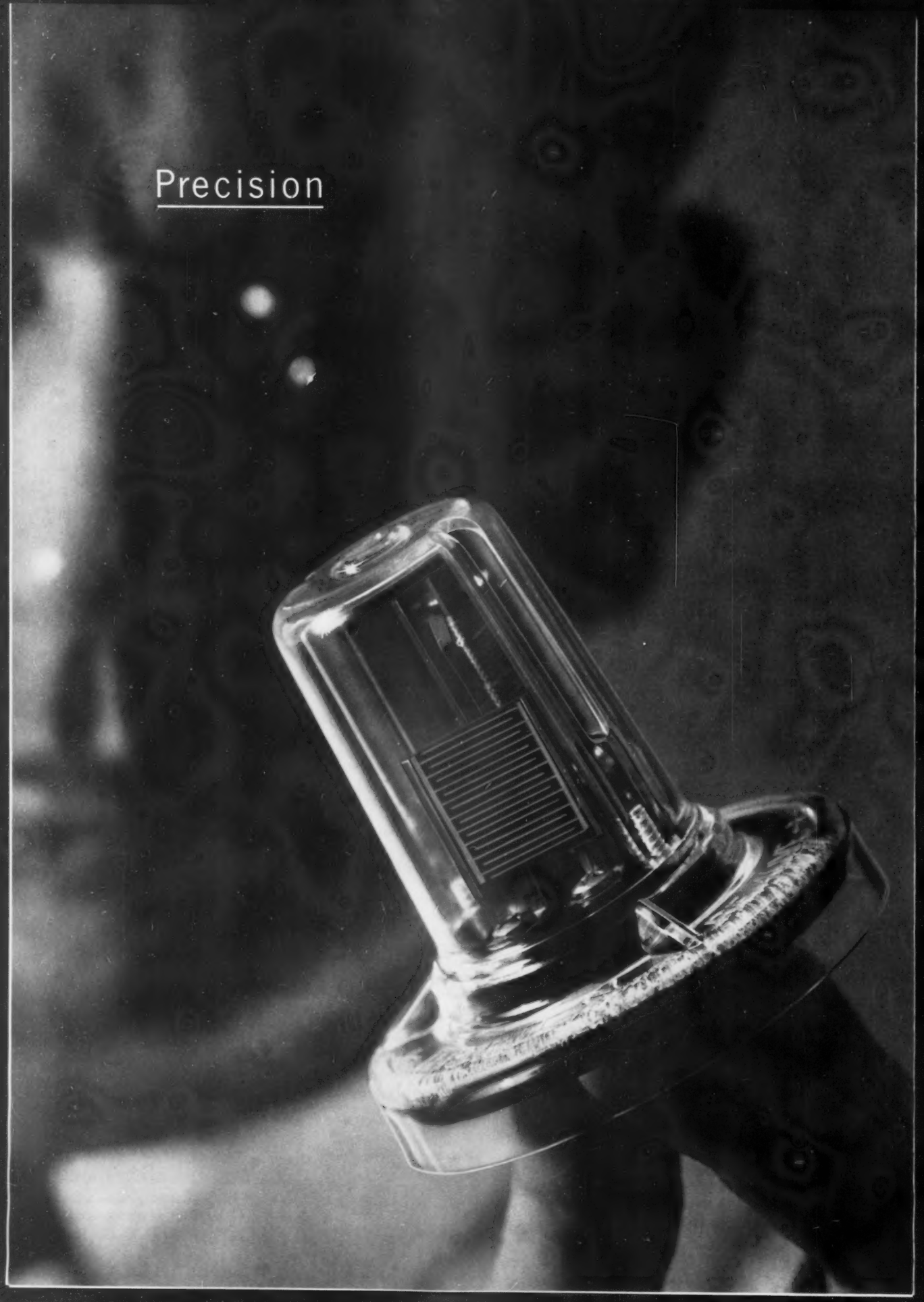
Thorpe B. Isaacson, presiding Bishopric of the L.D.S. Church, opened the conference with a warning of the growing tax burden on business. That the governments take one-third of the profits of business for taxes, and in 10 years will take half, was predicted, and may before too long be confiscatory.

"Business Planning for Profit Control" was a practical marketing address by Jack M. Shaw, merchandise and sales promotion manager for home appliances for the Utah group of Sears & Roebuck stores. From a newspaper publisher's standpoint, O. Preston Robinson, general manager, the *Deseret News*, punctured the "Illusions in Marketing" with sound advice on advertising and promotion.

Brinton Electric Co. of Murray, Utah, Marshall Brinton and David B. Brinton, owners, received the IEA trophy for the firm that has contributed most to the IEA during 1960. Life membership plaques were awarded to L. B. Johnson, retired General Electric Co., wiring materials representative, and to George E. Larsen, retiring commercial manager for the Provo city utilities.

The afternoon session featured Laurence C. Messick, director of the national Live Better Electrically program from New York City, who outlined the year's activities from the national level. Giving the viewpoints from the local angle of the wholesaler, was Howard Oliphant, G-E Sales and Distribution, Salt Lake

**Walter J. Michelsen, 1960 president; Dale Brown, 1961 president of the association**


Precision

# How Precision's exclusive qualities make multiple lighting control **99% fail-proof**

This engineer uses a jeweler's glass for his final inspection of every Precision photocontrol. Other Precision engineers use ageing chambers, comparators, endurance and hardness testers, oscilloscopes and weatherometers — plus devices originated by Precision for "breakdown" testing of lighting controls — to insure Precision performance at sixteen separate quality control points in our labs.

It is their attention to perfection that makes Precision photocontrols so nearly fail-proof that Precision-equipped multiple lighting systems need only 1% controls replacement in any given year. That is a fact, proved on the lines of major utilities a half million times every day. This perfection results from built-in Precision distinctions that set this control apart from all complex, old-style photocontrols.

### Superior materials

Precision uses the industry's largest gold electrode cadmium sulfide cell and gives it total area exposure since both shading and shielding reduce the efficiency of any photocell. Precision makes and uses the only bimetal switch metallurgically-balanced specifically for lighting control. Then Precision adds special pre-fabrication techniques possible only in the world's largest laboratory devoted entirely to multiple lighting controls: measured-atmosphere ageing, heat treating, electronic-measurement of switch calibration accuracy. No other company can invest so much skill in **every** control.

### Advanced engineering

Precision gave multiple lighting its "reliability breakthrough" five years ago and continues to lead the field with the only control designed, engineered and developed for one purpose — precise regulation of artificial lighting twice each day through rigid and unfailing response to natural light levels. Other controls are adaptations from obsolete tube-type controls containing up to 18 fragile components. Precision controls have only 2 components. Precision engineering eliminates all inherent fail-out hazards of capacitors, contact balances, magnetic relays, rectifiers, sensing flexible leads, tubes and printed circuits.

### Laboratory production

Precision controls are built entirely by technicians, to insure the human-eye responsiveness with all-weather durability demanded in multiple lighting control. Major utilities in every geographical region of North America have contributed field-engineering recommendations during the past four years that have made these controls virtually fail-proof on 400,000 installations. They will utilize the expanded production facilities of Precision to put thousands more of these perfected controls on the line in 1961.

### Field service engineers

Because Precision controls are used on more different installations than any other tubeless control, our field engineering representatives have unique experience in automatic control of multiple systems under all conditions. They are your ablest advisors in matching this perfected control to your most specific demands of weather, surge, lightning or light levels.

Write or wire today for data and quotations.

**PRECISION** MULTIPLE CONTROLS, INC. • Ridgewood, New Jersey

*The difference between night and day*

*For phone number of closest representative see advertising index in back of book.*

**Keeping line clearance costs DOWN goodwill UP**

Proven power equipment and Davey trained rope climbers . . . that's what makes Davey Surgical Line Clearance so economical. Utilities can rely on the dependable, efficient, and *adaptable* Davey crew. It will pay you to talk over your tree maintenance problems with the West's leading line clearing specialists—Call Davey.

**DAVEY**
**TREE SURGERY CO., LTD.**
**OF CALIFORNIA**

SAN FRANCISCO • Russ Building
LOS ANGELES • Story Building

**ELECTRICAL ENGINEERS:**

Constant innovations in already complicated construction make Estimating a distinct and exacting profession, requiring constant research. There can be substantial difference in cost between two apparently similar projects.

Thus, more and more owners, architects and engineers are using our estimating service. It includes:

1. Preliminary estimates to keep building costs within budgetary limits.
2. Comparative costs of alternative designs, materials, equipment, systems, schemes, etc. as an aid in selecting the materials, etc. most suited to each project.
3. Final cost estimates, the quantities of which may be furnished as an aid to bidders or as a basis of fair competition.
4. Cost estimates of desired changes during construction.
5. Checking of contractor's estimates of work in support of partial payments.
6. Construction cost counselors from beginning of preliminary plans to final completion of project.

**Ask us for complete details of our estimating service for Electrical Engineers.**

**LeRoy Construction Services**

**768 Brannan Street San Francisco 3**
**UN 1-2483**


City; the retailer, Boyd Read, Read Brothers, Ogden; the electrical contractor, Ken Duncan, Duncan Electric, Bountiful; the utility, De Lamar Holt, Utah Power & Light; the electronic service shop, Roger Stover, Stover's TV Service, Roy, Utah; the appliance service shop, William A. Marsh, Marsh Sales & Service.

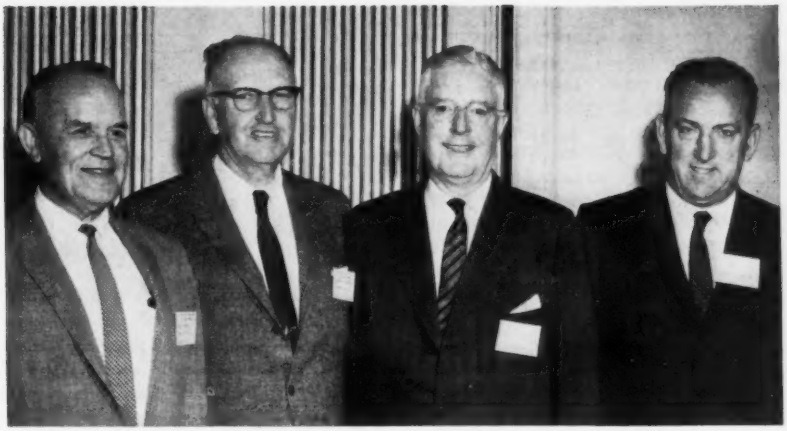
Dale Brown, vice president of J. R. Christensen & Associates, manufacturers' representative, was installed as the president; Darcie H. White, Utah Power & Light Co., the vice president; Robert W. Darger, the Darger Co., secretary-treasurer; as were the directors representing retailers, contractors, wholesalers, manufacturers, utilities and service shops; and the chapter chairmen from Cache Valley, Ogden, and the Upper Snake River Valley.

## NCEB Officers

Maintaining the momentum gained in its promotional programs during 1960 and going on to increased ones for 1961 the Northern California Electrical Bureau re-elected all of its officers and most of its directors for another year at the annual meeting, Feb. 23, in San Francisco. G. L. "Bill" Call, Graybar Electric Co., was continued as president, as were R. M. Sanford, A. H. Meyer Co., as vice president; O. R. Doerr, Pacific Gas and Electric Co., secretary; Henry A. Adams, Western Merchandise Mart, treasurer; John S. C. Ross, PG and E, chairman, executive committee, and Bert W. Reynolds, manager.

Four new units were admitted during the year, three of them taking the place of the former East Bay unit. They are: South Alameda County, Oakland-Berkeley and Contra Costa, plus a new unit in Nevada County. A new electric heating division has been formed in addition to the appliance, lighting, wiring and other divisions and committees. Announced was the new Reddy Recommended Dealer program for identification of dealers and contractors with the utility and bureau advertising.

► Al D. Dahlstrom was elected chairman of the **Eastern Washington Chapter, IAEI,** for the year 1961 at its last meeting. Vice chairman is Maurice E. Anthony; secretary-treasurer, Roy E. Crosby; and the executive committee consists of Alex Godfrey, Elden Wigen, Dale Olsen and Harvey Crumbaker. The chapter voted to hold a joint meeting, possibly in April, with the Puget Sound Chapter.



Amid much spirited discussion and such speakers as Senator Thomas H. Kuchel, American Public Power Assn.'s Alex Radin and William C. Dixon, California assistant attorney general, the California Municipal Utilities Assn. met in San Francisco March 8-10 and elected the officers pictured. Left to right: Ralph Foy, general manager, Burbank Public Service Department, president; Glenn A. Baxter, general manager, Alameda Bureau of Electricity, treasurer; Harold Raines, East Bay Municipal Utility District, Oakland, vice president; F. V. Frey, supervisor, Pasadena Light & Power Department, secretary

## NECA Elections

**San Diego Chapter,** National Electrical Contractors Assn., elected Neville L. Baker as its president; A. W. Myers, governor; George L. Byrum, vice president; John Q. Adams, treasurer. On the board are Norman Ferguson, who is NECA District 9 vice president, Robert W. Davies and Ted Verdugo Jr. in addition to the officers.

**Oregon-Columbia Chapter, NECA,** Portland, elected as president for a second term J. W. McKinnon, Tice Electric Co., and S. S. Adams, Electrical Construction Co., as governor. Other officers elected were W. R. McCabe, Lord Electric Co., vice president; D. R. Dimitre, treasurer; J. L. Krauser and J. A. McCoy, directors. Robert Burns is manager.

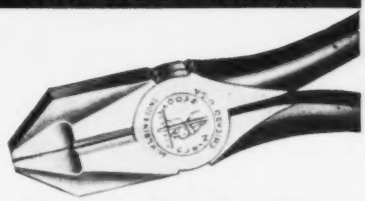
Ernest Canete, new president, and Robert Coleman, manager, San Mateo NECA

**San Mateo County Chapter, NECA,** installed and feted its newly elected officers at an annual dinner recently. Ernest Canete, R. C. Electric Co., Redwood City, was installed as president to succeed Everett Marshall, who was honored with a gift by the chapter for his long service to the organizatoin as president since the chapter was founded. Other officers installed were: W. D. Rigler, Reco Electrical Contractors, vice president; Stanley Fitschen, Safe Electric, Belmont, treasurer; W. H. Gillard, Redwood City, governor. Officers of neighboring Bay area chapters and of the IBEW, utilities and other industry groups were guests at the affair.

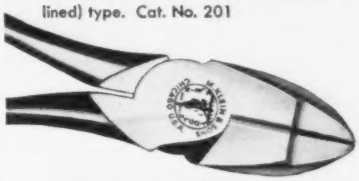
**Southern Colorado Chapter, NECA,** Colorado Springs, named Allen L. Bader, Electrical Construction Co., as its president at the recent annual meeting. Harold M. Whitney was named secretary-treasurer as well as governor; Leo Moreschini, Steel City Electric, Pueblo, vice president; and directors, Earl Coleman, Pueblo; Ed Laxson, Bridges-Laxson Electric, and Kenneth A. Weaver, Ken's Electric, both of Colorado Springs. Bader declared the objectives of his administration were to promote electric heating, cooperation with architects, engineers and general contractors on better specifications, journeyman and apprentice training in the new fields of electronics. Simon Halle is Southern Colorado Chapter manager.

**Northern California Chapter,** NECA, recently completed elections of officers for the chapter and for


KLEINS
for LINEMEN and ELECTRICIANS



**The Original Klein Side Cutting Plier**—Also available in NE (Streamlined) type. Cat. No. 201



**High Leverage Plier**—Extra high leverage permits cutting extremely tough wire. Also available in the standard type as shown above. Cat. No. 213-9NE

**High Leverage Oblique Cutting Plier**—A recently introduced plier designed to cut toughest wire. Cat. No. 228-8

**Electrician Conduit Plier**—Reams inside and outside of conduit, tightens lock nuts in outlet boxes. Cat. No. 333-8

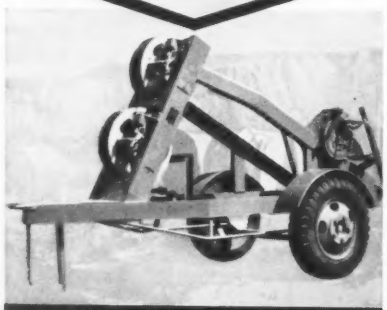
"Since 1857" the name Klein has stood for the finest in tools and equipment for linemen and electricians. It is the uncompromising high quality back of the name Klein that has won Klein Pliers their place in the hands of men who know good tools. Klein Pliers are now available in a wider variety of styles and sizes than ever before. Be sure the pliers you need carry the Klein trade-mark.

**Klein Catalog Free**—This new Klein catalog giving complete information on Klein tools and equipment for linemen and electricians will be sent on request. Write for your copy.

**Ask Your Supplier**—Foreign Distributor: International Standard Electric Corp., N.Y.

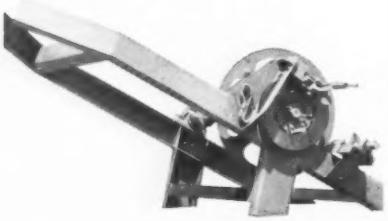
Mathias Established 1857 KLEIN & Sons Chicago, Ill., U.S.A.
7200 McCORMICK ROAD • CHICAGO 45, ILLINOIS

Now—Convert your own Reel Dolly to a Bullwheel Tensioner
WITH A
PENGO
5000-U Assembly



5000-U assembly installed by City of Medicine Hat, Alberta, Canada

Here's an easy way to build up a modern bullwheel tensioner at low cost—simply install a PENGO 5000-U Bullwheel Assembly to your old trailer or reel dolly. You'll have a tensioner with Neoprene-lined 26" bullwheels, capable of handling practically any distribution line stringing job at tensions to 2,000 lbs. at up to 4 mph.



Support arms, reel spindle with reel brake, and hand rewind assembly. 2⅝" spindle will handle reels to 75" diameter, 44" width unless reduced to fit your trailer.

Bullwheel and tension brake assembly may be purchased separately.

*We invite you to write or wire for literature, prices—please address Dept. 34*

PETERSEN
ENGINEERING COMPANY, INC.
Santa Clara, California
16 Phone: AXminster 6-7712

each of its three branches. It decided to continue its chapter officers in charge for another year. They are George Curran, Emeryville, president; Robert Ingersol, Richmond, vice president; Jack Ellis, Vallejo, director; and Walter Vance, Oakland, chapter governor. For the Alameda Branch William Spalding, Hayward, was elected chairman and Jack Milstein, Alameda, vice chairman. For the Contra Costa Branch, Cy Hagstrom of Rodeo was elected chairman and Boris Larson, Concord, vice chairman. The Solano-Napa Branch elected Robert Covey of Fairfield chairman; Don Pearce, Vallejo, vice chairman; and Hal Pierce, former chairman, to the directorship.

**Sacramento Valley Chapter,** NECA, at its recent annual meeting elected Hugo E. Becker as its president, John L. Morrow as vice president, Carroll J. Keys, treasurer, and B. L. Slater, governor. Other directors are Robert Jewell, Kenneth Carlson, Ruben Kiehn, Leonard Wesleder and Rex Moore Jr. Joseph T. Krivanek is secretary-manager. Officers were installed at a dinner dance Feb. 21 at Arden Hills Club.

E. C. Armstrong of Wazee Electric Co. was elected president of the **Rocky Mountain Chapter, National Electrical Contractors Assn.,** and installed at a special luncheon meeting in Denver. Other officers named were: Ernest Graham, Belmont Electric Service, vice president; Steve Strong, Scott Bros. Electric Co., secretary; and Roy Kennedy, Kennedy Electric Co., treasurer. Harris Steele of Reliable Electric was returned as governor. Also honored with a diamond-studded NECA tie tack were charter members of the chapter: J. E. Collier, Collier Electric; A. J. Moroni, Electric Equipment & Engineering Co.; E. J. Strominger, Strominger Electric; and C. H. Simpson, Simpson Electric, and F. W. Fitch, Fitch Electric, both of Cheyenne. John Hecht, chapter manager, made the annual luncheon and awards arrangements.

► **Lloyd M. Grames,** who has been chairman of the **Utah Chapter, IAEI,** left Utah Fire Rating Bureau Nov. 1 to become sales engineer in the Filter Division of Eimco in Salt Lake City. The Utah Chapter advanced Aaron Clinger, Orem city electrical inspector, to the chairmanship. V. C. DuVander, Utah Power & Light, was advanced from second vice chairman to first vice chairman and Fred A. Bradshaw, Dayton City inspector, was later elected second vice chairman.

**Matt Gallagher, Northern California Chapter manager, and George "Red Top" Curran, re-elected NECA chapter president**

**Hugo Becker takes over presidency of the Sacramento Chapter, NECA, from Bob Jewell at recent installation dinner**

## IES Regional Meetings

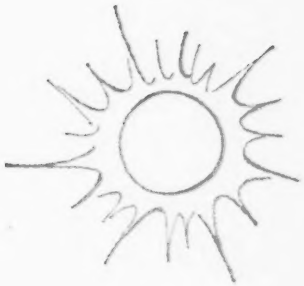
Different approaches will be made in program content at the three annual regional conferences of the Illuminating Engineering Society in the West during May. The Intermountain conference will be held at Hotel Utah, Salt Lake City, May 1 and 2. The South Pacific Coast regional meeting will be held at Sacramento Inn, Sacramento, May 3, 4 and 5. The Pacific Northwest conference will be held at Harrison Hot Springs Resort Hotel in British Columbia on May 8 and 9.

Prominent speakers from the major lighting and lamp companies as well as the research director of IES will follow the typical conference pattern for the Intermountain meeting, according to preliminary announcment by J. Homer Shaw, program chairman. In addition to the applied lighting competition, which will be featured at each of the conferences, the Salt Lake meeting will have: "Operating Character-

istics of Fluorescent Lamp Ballasts" by a speaker from Jefferson Electric of Bellwood, Ill.; "Factors Affecting the Efficiency of Street Lighting Systems," by H. Allen Van Dusen, development engineer of Line Material Industries; "Interior Lighting Practice for the '60s," by Robert T. Dorsey, Lamp Division, General Electric Co., Cleveland; "Combination Air-Handling Lighting Troffers," by Walter L. Haspedis, vice president, Columbia Lighting, Spokane; "Five Factors in Modern Office Lighting Designs," by G. G. Rae, sales manager, Holophane Co., New York. Robert Dorsey will likewise speak on "Exterior Lighting Practice for the '60s." Willard Allphin, commercial engineer, Sylvania Electric Products, Salem, Mass., will speak on "Discomfort Glare." C. L. Crouch, technical director of IES, is likewise expected and a speaker from Day-Brite Lighting Inc. of St. Louis. Wayne Mulcock, Utah Power & Light, is general chairman and Don Dehrenforth, G-E Lamp, co-chairman.

Something of a symposium of the Illuminating Engineering Research Institute will be the form for the Sacramento conference of the South Pacific region. Under Program Chairman Charles Gibson, director of the State Division of School Planning, some of the nation's top research speakers have been lined up to appear to start the conference. The pattern will be "from research to technology to application in visual engineering." The researchers listed include E. M. Strong of Cornell University; Dr. H. R. Blackwell, Ohio State University; Dr. Glenn A. Frye, director, School of Optometry, Ohio State; John Chorlton, Toronto, Canada; Dr. Ralph Hopkinson of England; Willard Allphin of Sylvania; and C. L. Crouch, IES technical director. In relating the research results to technology will be Richard Slauer, president, IES; Henry L. Wright, first vice president, AIA; Foster K. Sampson, electrical engineer; Karl Freund, president, Photo Research Corp.; and C. M. Deasy, architect. Aim of the program committee is to bring a clearer understanding of the research background of the application aspects in the visual engineering field. Mel Fenton is general chairman.

Little is available on the program of the Pacific Northwest conference so far. Douglas Gordon is papers chairman and evidently the list of speakers and subjects has not been confirmed. D. A. Adams of Griffin Sales Ltd., Vancouver, is general chairman.

**In Boston**

**even the photocontrol companies are conservative**

Not conservatively *old-fashioned* — just conservatively *careful* about shouting the virtues of something new, before it has had a chance to prove itself.

Fisher-Pierce is a photocontrol company in Boston,* and has something new: a simplified control with fewer parts and consequently a lower price, and another new control ideal for lower (500) watt applications such as farm buildings, gas stations and the like.

Both look good and both are well worth trying on your job. Neither, however, has the indisputable proof of field experience the "good old" 6600A has . . . *yet.*

Fisher-Pierce Division, Sigma Instruments, Inc., 43 Pearl St., So. Braintree 85, Mass.

*Well, 15 miles due south of Beacon Hill

FP

**FISHER PIERCE**

**Electrical and Electronic Equipment for Industry, Utilities and the Home**

# ELECTRICAL WEST

VOL. 126. NO. 4 APRIL 1961


## TAXES: A QUESTION OF FAIRNESS

Sherman Knapp, EEI president, recently pegged the private industry's contributions to the local, state and federal tax coffers as $2,350,000,000. A lot of money? Here's how much:

Private electric utilities, taxes will **annually** finance

| | |
|---|---|
| **10,000 equipped school rooms @ $17,500** | **$175,000,000** |
| **10,000 teachers @ $6,622** | **66,220,000** |
| **500 senators @ $22,500** | **11,250,000** |
| **1,000 miles of four-lane highway** | **500,000,000** |
| **10,000 prisoners' maintenance** | **12,000,000** |
| **10,000 families in public housing** | **98,260,000** |
| **10,000 Niki Ajax missiles** | **830,000,000** |
| **100,000 officers, soldiers and sailors** | **600,000,000** |
| **Total** | **$2,292,730,000** |
| **Balance** | **57,270,000** |
| | **$2,350,000,000** |

Knapp also made the point that if the power systems sponsored by federal, state and local governments paid taxes on the same schedule as the private companies **$500 million more tax money** would be available.

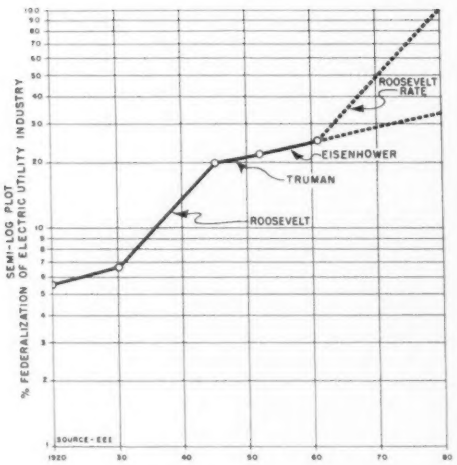
There is no reasonable basis for the rate payer of municipal power enterprises not to pay as much to finance the national government as the private companies they have replaced. It is even more ridiculous for federal power projects to duck state and local taxation and then launch programs of federal aid to schools, highways and housing.

**Conclusions** – (1) All taxes are paid by the American people. Corporation taxes mean higher priced products. Taxes on power companies mean higher priced power. (2) Tax-free power merely shifts the burden to other people. (3) Tax favoritism is a tool that is used to make private power appear noncompetitive. (4) Tax favoritism, because it can be used to curtail any business, is unfair and should be corrected.

**A Case in Point** – The Bonneville-California tie is an example of a project that requires federal tax-free status to even get close to economic feasibility. The present proposal calls for tax freedom in California too. If it's important to build the line (regardless of economic facts), why not offer the private utilities a tax break? The answer is clear. **It is the purpose of many in our government to federalize the power industry.** If not, why do they persist in trying to build a Rocky Mountain grid when the private companies have agreed to stand the tax gaff and build it anyway?

**Politics at the Root**—Federalization of the power industry is a function of political viewpoint. The semi-log plot of the percentage of federal capacity during the past three presidential periods demonstrates this point. Federalization, carried forward at the Roosevelt rate, **kills the private industry by 1980.** The 1945 to 1960 rate puts the figure at less than 50% by 1990.

It's high time Americans began measuring the apparent blessings of subsidized federal power against the real blessings of living without it.



# HIGHER DISTRIBUTION VOLTAGES

## Seattle City Light eliminates one transformation—uses 26 kv

H. V. STRANDBERG, CHIEF ENGINEER; L. L. GLEASON, SUPERVISING SENIOR ENGINEER

Seattle City Light, along with many other utilities, realizes that the recent development of distribution equipment for high voltage primary, 23 kv to 34 kv, makes available a voltage level having possible economic advantages. The city system, having a 26-kv subtransmission voltage, can accomplish the obvious of eliminating one voltage transformation if this subtransmission can be used as a 15/26Y-kv distribution primary. The eliminated transformation is the distribution substation. However, in a service area similar to the city's, with 130 square miles at an average load of 6,000 kva per square mile served by a 4-kv primary network system, any adoption of a new primary will involve conversion of the existing system on a selected area basis.

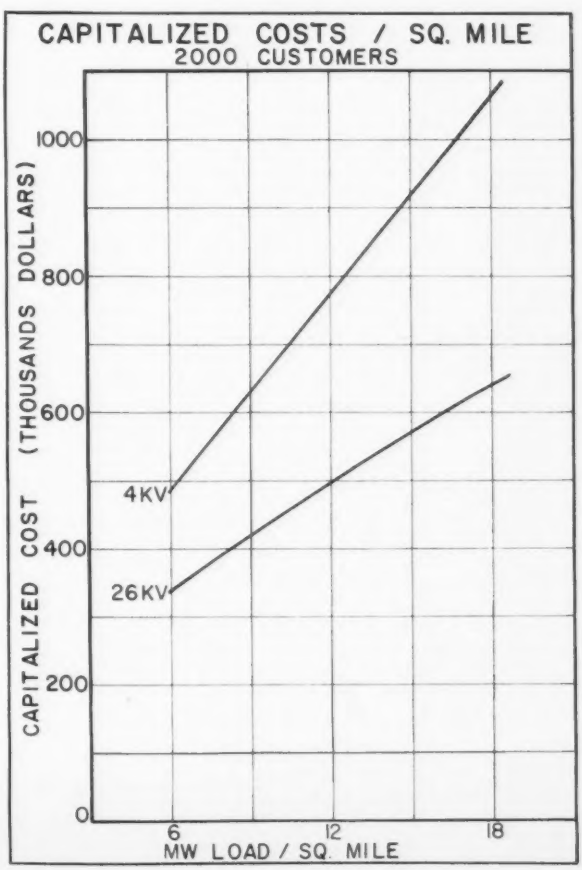
The approach to a solution has been to make an economic analysis of a new system for both voltage levels starting from a common point, the existing receiving substation 26-kv bus. Then, with the economic margin established, we analyzed voltage regulation, voltage control, operation, growth characteristics, equipment utilization, continuity of service, safety and public acceptance and a logical procedure for conversion.

The economic analysis was eased of much of its drudgery by the use of two of the available digital computer programs. These programs developed capital costs for each voltage level from the common point to the customer's service drop in terms of cost per kilowatt of load served. Many combinations of load and equipment sizes were analyzed, thereby permitting an optimum analysis of the system.

The economic analysis shows capital cost reduction of almost constant $23 per kw of load for the 26-kv primary system. This difference at 6,000 kva per square mile is made up of five components: $20 for elimination of distribution substation, $5 for elimination of 4-kv primary mains, $5 for reduced losses, minus $5 for added cost of 26-kv distribution transformer, and minus $2 for reduced utilization of 26-kv terminal and line equipment.

By the computer analysis, the 26-kv system has 36% less voltage drop than the 4-kv primary design serving load densities of 6 to 18 mva per square mile. The voltage control of the existing receiving substations by reactive power supply is adequate for a 26-kv primary system. The operation of the 26 kv has the advantage of working below circuit load limits. The elimination of operation and maintenance expense of distribution substations will add $2.30 per kw to the $23 margin. The growth characteristics show reduced cost per kilowatt with increased load density for both voltages. The equipment utilization for the 26 kv is somewhat lower at the optimized load level. To obtain equivalent continuity of service on the 26-kv primary with 4.5 times more customers per primary main is difficult, but the planned use of sectionalizers at each lateral to main tap promises to provide the continuity of service characteristics of the existing 4-kv system.

Details of the conversion have not been finalized, but it is anticipated that a 5% conversion of the 4-kv system per year will provide 4-kv equipment (distribution substations and distribution transformers) for planned unconverted area growth. The decision to use these apparent advantages of converting an existing subtransmission system to a primary system ultimately will depend on the cost of conversion with a logical procedure in converting to permit the greatest utilization of the displaced equipment. A big assist in this procedure can come from converting the existing 4-kv primary network to a radial system in those areas selected for conversion to a 26-kv system.




**The load growth that results in higher load densities is of major significance in a decision to make a change in primary voltage level. This is indicated by the capital cost comparison with area load density as plotted on the chart shown at the right**

# 34.5 KV FEEDS IN A LARGE CITY

## A fast growing city requires fast thinking and action to keep up with its power needs

CARL F. BRENGARTNER, ELECTRICAL ENGINEERING ASSOCIATE, LOS ANGELES DEPARTMENT OF WATER & POWER

Modern civilization in a metropolitan area has become so dependent on electricity that its availability is a necessity for life itself. In this era of rapidly increasing load, the ability of the electrical utility to meet demands by the least costly method of expansion can to a marked degree determine the growth and progress of the entire community.

In 1957 the Department of Water & Power of the city of Los Angeles completed its fourth decennial study on existing land use and corresponding kilowatt demands. The results of these studies showed that an ultimate total load in the order of seven times the 1957-58 system peak could be expected, indicating that it was certainly advisable to devote considerable attention to long-range planning at the distribution level.

### System Backbone

The backbone of the department's distribution system is the 4.8-kv radial feeder. At the present, there are 797 of these circuits with 616 classified as overhead and the balance of 181 as underground. They originate and radiate from 115 distributing stations and cover an area of 450 square miles.

The subtransmission system, operated at 34.5 kv, is the next higher operating voltage above the 4.8-kv level. Historically, the 34.5-kv system has served a dual purpose. Primarily it has been used for trunk lines to move energy from large bulk power receiving stations (now 12 in number) to the 115 distribution stations. It has also been used as a radial feeder system to supply medium to large industrial plants almost always by means of overhead circuits in industrial areas. The 34.5-kv system is in most of the 450 square miles in the city and presently consists of 921 circuit miles of overhead conductors and 210 miles of underground cables.

Two basic distribution plans for supplying future loads were investigated. One plan considered raising the present primary feeder voltage and the other plan considered using the subtransmission voltage to serve a large portion of the new load.

Under the plan to raise the 4.8-kv system to some higher voltage, both the 8.3-kv and the 12.4-kv systems were studied in considerable detail. The significant results of these studies can be summarized as follows.

### Study Summarized

1. A system planner contemplating a major change in an extensive and growing distribution system is in much the same position as a laboratory rat working its way through a maze after a piece of cheese. Nevertheless, the planner must reject or treat with extreme care any shortcut answers that are based on typical, equivalent or symmetrical feeders; round, square or rectangular load areas; and uniform or average load densities. He must also recognize the uncertainty of the magnitude and location of future loads and understand that a distribution system, regardless of planning, comes into being in a piecemeal fashion, subject to considerable pressure from "everyday stress."

2. The careful weighing of the practical aspects of converting to a new higher primary voltage indicated that load growth on the 4.8-kv system would exceed the load that could be added or converted on the new higher voltage system and we would never get the job done.

3. Generally speaking, the raising of the primary voltage is not likely to result in significant cost savings, unless the number of transformations is reduced.

4. The introduction of a new primary voltage in old areas reduces the number of field ties and the built-in emergency substation backup, complicates systems operations and weakens the distribution plant.

5. Considering the magnitude of our future load estimates, any primary voltages in the order of 8, 12, or even 16 kv, could be regarded as a crutch, which at some not-too-future date would result in the same familiar problems as the 4.8-kv system presents today.

Thus, a bewildering distribution system planning study rapidly developed into a case of finding the ways and means for serving a much larger portion of new load from the subtransmission 34.5-kv system.

Satisfactory and economical ways for serving large loads in Los Angeles industrial areas have been developed and used for many years. The 34.5-kv overhead line and a conventional wire fence enclosed outdoor station serves very well for the oil refinery, the steel mill, the chemical plant or the aircraft factory. For small loads in industrial areas the pole-rack type of station has been used to good advantage. Appearance and noise have little significance in such areas.

**A new building, like this recently completed Signal Oil headquarters, needs large blocks of power—34.5-kv feed does the job**

Where industrial plants are built in close proximity to residences and commercial establishments, noise and appearances do have significance and must be taken into consideration. These factors can increase the cost but much the same problems exist regardless of the voltage level. Again, 34.5 kv has proved to be satisfactory and economical and a high percentage of this type of load in overhead areas has been served from the 34.5-kv system.

It seemed evident that the most likely field for increasing loads on the 34.5-kv system was the almost untouched high load density commercial underground areas. This brought into sharp focus the necessity for downgrading the convenient and attractive characteristics of the 4.8-kv system and tackling the much tougher problem of when, where and how to expand the 34.5-kv system.

### Existing Conduit

It was recognized that if underground 34.5-kv costs were to be held down, maximum use must be made of the existing low-voltage conduit system and the spare capacity in existing station-to-station trunk lines. The new feeders to be installed would follow a predetermined pattern after careful study of future load possibilities along the routes.

Loads in high density commercial underground areas are large and service reliability is very important. A paper-lead 34.5-kv cable with its conventional splices and terminations has a low failure rate. But failures will occur and the time required to make repairs becomes a serious matter. Sectionalization is a partial answer, but such 34.5-kv equipment requires considerable space in a manhole and is expensive. With large loads a two-line supply is being provided with load-break disconnects in the transformer station in the customer's building.

### Manual Disconnect

These manually operated disconnects under customer control do not prevent outages, but they do limit their duration to a few minutes. To prevent serious overloading of circuits, nonessential loads such as air conditioning are locked out when a customer is riding on the stand-by circuit. This lockout arrangement,

**Wilshire Boulevard, a pleasure to behold. No power poles, no trenching for conduit in evidence. A tribute to good planning**

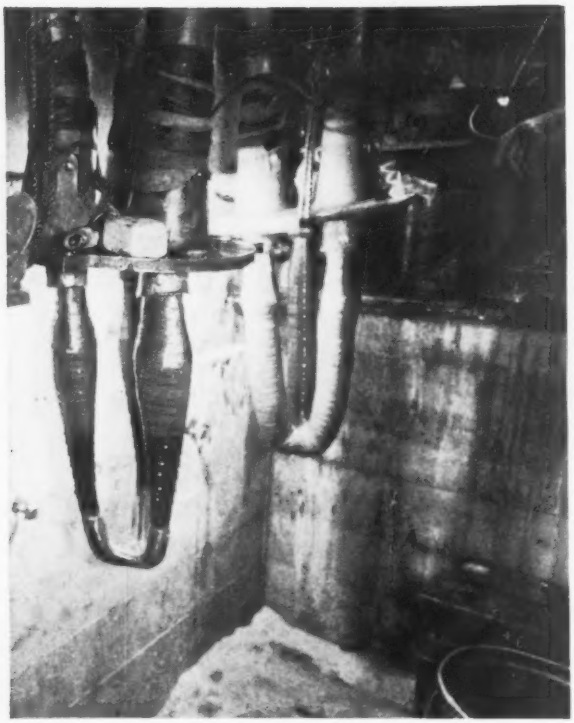


**Photo left shows a partially completed three-way connection with cables on the first phase brought through cover of the tank and soldered into the milk stool; the second phase with stress cone completed; and the third phase completed. Right, completed job**

together with an acceptance of a 20% overload, permits operating up to 75% of cable rating under normal conditions.

### Tapping Methods

From a technical standpoint, the introduction of 34.5-kv feeders into high load density underground areas involved the selection of the size and type of cable to be used, the development of a three- or four-way connection for tapping laterals into the main feeder cables, the design of a manhole to accommodate the connections, and the integration of the high- and low-voltage conduit systems.

### Paper-Insulated Cable

All cable used is paper insulated, lead covered, without protective jacket. The main feeders are three conductors with 750 mcm and 500 mcm being the standard sizes. Some solid, oil-filled and gas-filled cables are in service; however, recent installations are gas filled and this is now the preferred type. If the feeders are to remain as radials, without the possibility of a loop developing, the cable may be graded from 750 mcm at the station end down to 1/0 at the far end. Laterals to stations in the customer's buildings can be either three-conductor or single-conductor cable.

The connection used for tapping laterals into main feeders is a three-way or four-way single-phase device. The three conductor cables are changed by splicing or trifurcating into single-conductor cables. The three or four legs of one phase are soldered into a "milk-stool" type of connector, taped and then put in a tank of oil with barriers. When gas-filled cables are used, a tube cross connection is made above the tanks to prevent a differential gas pressure from forcing oil out of the tanks.

This oil-filled tank-type joint has proved to be very reliable, but it cannot be used for sectionalizing. A compact, relatively inexpensive, oil filled, bayonet type, four way, 34.5-kv junction box has recently been produced by two large manufacturers. Several have been purchased for test and trial installation.

### Space Savings

Much work still needs to be done in the field of 34.5-kv distribution. Network transformers and spot networks with the transformers located in buildings or in street vaults or in parkways look promising from a space requirement and service reliability standpoint. More use of power fusing is indicated and 34.5-kv overhead along rear property lines in residential tracts is receiving attention.

### Progress Measured

Since results are the best measure of progress, some statistics may help. As of June 30, 1960, a total of 2,555,445 kva of transformer capacity was connected to the 4.8-kv system with 120,808 kva added during the year. As of the same date, 812,984 kva of transformer capacity was connected to the 34.5-kv system with 142,872 kva added during the year. Thus, for the first time, the load added to the 34.5-kv system exceeded the load added to the 4.8-kv system. This progress was made with very little conversion of existing load and no 34.5-kv supply to residential type loads other than very large apartment buildings.

Based on our experience to date, we can with some confidence expect in the future to have 60% of the load in the high-density downtown area and 90% of heavy industry, light industry and heavy commercial in the remainder of the city on the 34.5-kv distribution system. Long-term planning can, of course, be modified from time to time, depending upon future developments.

# NEWS FROM IDAHO

## 20/34.5 kv looks good

DON E. HAASCH, IDAHO POWER CO.

The growth of loads and the development of new areas have caused many problems within the Idaho Power company system and distribution voltages, higher than 12.5 kv, have been a real help in solving these problems. In the last two years many studies were made of the 20/34.5-kv system, and this was found to be the route to the economical solution of many problems.

Before the decision was made to install the 20/34.5-kv system, much preliminary investigation was done and in the final analysis this system had to stand the test, "Is it the most economical method as to first cost? Will it be the cheaper method to have in use five years from now?" In each case investigated, the answer was a definite yes.

For example, one area was being served with 7.2/12.5 kv which had an existing pump load of about 800 hp and it appeared that 12 or 15 more pumps would be installed during 1961. A preliminary investigation indicated the best method of serving the new load lay between installing two 46/12.5-kv substations in the area or one 138/34.5-kv substation — one 46/12.5-kv substation could not be expected to serve the area of the load satisfactorily because of the width and length involved. It was decided to install a temporary station of 46/34.5 kv this year and to reinsulate the present 12.5-kv lines. All new lines will be constructed for the higher distribution voltage. Next year, a 138/34.5-kv station will be built with an eventual capacity of 25 mw.

In serving long string valleys, additional problems were encountered from the standpoint of the physical distance involved. For example, two long 12.5-kv feeders that serve such a valley will have step-up and step-down transformers installed to reduce the electrical length of the feeder. The distance between the transformers is 10 miles. The transformation reduces this 10 statute miles to one and one-third electrical miles. At a later date the remainder of the feeders in this valley will be cut over to the higher voltage.

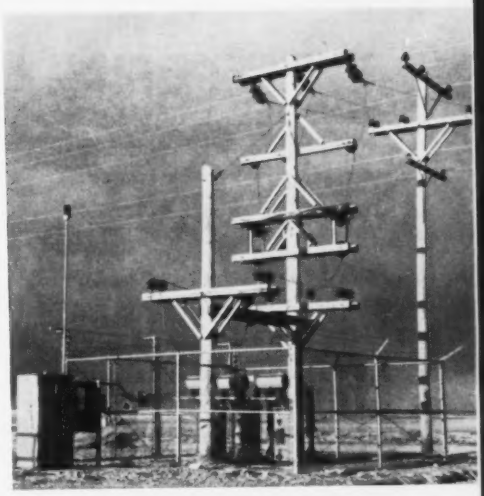
In another long string valley of 50 miles and 35 customers requiring service, several estimates were prepared employing different schemes. Finally it was decided that a single-phase 20-kv system was the most economical to install.

In another case, a new pumping area opened up some 15 miles away from the end of an existing 20/34.5-kv feeder. A 138-kv transmission line also bordered the area. Here a choice presented itself of tapping the transmission line and building a 12.5-kv distribution system or extending the 20/34.5-kv feeder. Because the 20/34.5-kv feeder would serve the expected load for two years and because of the possibility of a much larger load developing, the decision was made to serve the area with 20/34.5-kv by extending the 130 kv into the area and locating the substation after the area becomes better defined.

Another interesting development presented itself in an older sawmill town that was being served with a 14.4/25-kv line that had some customers along its entire length. Two voltage regulators had been installed in the line to maintain the primary voltage. Then came a request for an additional 500 hp at the sawmill within the next two years. This made a decision necessary on how to accomplish the immediate installation of more capacity.

Several schemes were considered, including extending a 69-kv subtransmission line, building a second feeder at 25 kv, reconductoring the present feeder and cutting over the present 14.4/25-kv feeder to 20/34.5 kv and also doing some reconductoring. After due consideration, the 20/34.5-kv scheme won the nod as it would provide all the capacity the town would need for 10 years.

Idaho Power has found the 20/34.5 kv a real tool for the distribution engineer in solving many problems involving load and distances, and has reserved a snug place in the tool kit for it.



Three 25-kva pad-mounted transformers enclosed in the conventional 34.5-kv manner

Above, 34.5-kv service to pumps. Below, 20-kv service to home—note 27-kv arresters

# WESTERN UNDERGROUND STATUS

## A Progress Report

After laying a firm roadbed and establishing the rules for the race, the Western Underground Committee has shifted gears and now appears to be in high in its search for solutions to common problems.

Several have asked: "What is the purpose of this committee?"

The recently revised constitution states, "It shall be the purpose of this committee to carry out on an industry-wide basis: (1) the exchange of information, ideas and experience of all members relating to the various phases of underground electrical utility design, construction, operation and maintenance; (2) to develop and standardize materials and designs to reduce costs and improve underground construction, operation and maintenance. All actions undertaken by the committee are to be of an advisory nature and are not binding on the utility members."

At a recent meeting in Pasadena, the various working subcommittees presented their first reports, which give a real indication of the fruits of the labor of this project.

Jack Oliphant, chairman of subcommittee No. 1 on system operations, and his committee presented reports on fault location. The committee had submitted to its membership a total of 18 questionnaires from which it received 11 answers. The questionnaire dealt with the program presently in use at the various utilities to prevent or locate potential faults before they occur. Eight of the respondents indicated that they either had or were considering a program to accomplish this end. Harold Jones of SMUD, who is chairman of the committee's electrical system components evaluation, presented a report prepared by Herb Woodbury of Pasadena on the subject of criteria for evaluating pad-mounted transformer design.

C. W. Callow of Southern California Edison, who is chairman of the committee's structural system components, presented a report on the questionnaire that had been drafted to survey presently used structural components in residential underground systems. This questionnaire was discussed and it was decided to study each of the structural components individually, starting with conduit and conduit systems.

WESTERN UNDERGROUND COMMITTEE

## RESIDENTIAL COST ANALYSIS

**Description of System** _____

_____

_____

_____

**Questions and Answers**

***(Please check correct answers below. Wherever necessary, please estimate.)***

1. Is there a pole line through or adjacent to this tract?
   Yes .... No ....
   If so, is the tract served by these overhead facilities?
   Yes .... No ....
2. Is this area essentially a distribution dead-end with little or no likelihood of extension in any direction?
   Yes .... No ....
3. Is provision made for primary feeders and trunk cables through or adjacent to this tract?
   Yes .... No ....
   If so, are these costs included?
   Yes .... No ....
4. Are provisions for underground extensions from this tract included in the cost?
   Yes .... No ....
5. Is any part of the electric utility's share of costs in the nature of a promotional allowance?
   Yes .... No ....

**Cost Breakdown**

| | *I. Total Underground Cost, in Dollars* | *II. Portion Assumed by Others** |
|---|---|---|
| Main trench and backfill | | |
| Service trench and backfill on lot only | | |
| Main duct | | |
| Service cable on lot only | | |
| All other cable | | |
| Structures, vault, manhole, pull box, etc. | | |
| Transformers, fuses | | |
| Switchgear | | |
| **Total Underground Cost** | | |
| DEDUCT: Pole line credit | | |
| Allowance Col. II | | |
| Total deductions | | |
| **Net Cost for Tract** | | |
| Number of underground lots | | |
| **Net Cost per Lot** | | |

**Comments affecting cost:**

.....

.....

.....

.....

*Identify who assumes part of costs, i.e., $2,000.00—by developer for telephone.

## WHAT'S BEHIND THIS FORM?

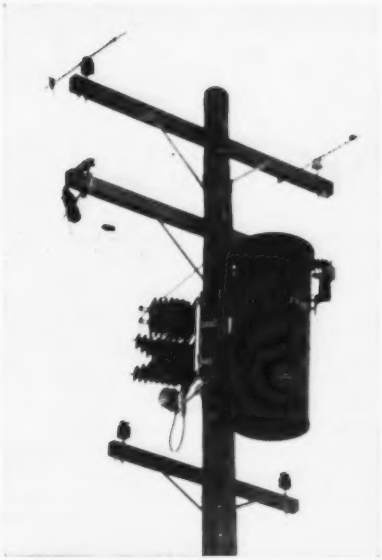
It comes as a terse note from the boss—"How come Wattless Light & Power can go underground for $62 more than overhead? Attached is a magazine article." Thus starts a most time-consuming (and unproductive) job for underground engineers, the task of analyzing other people's underground costs. The job is one of separating real from imaginary improvements in technique.

To reduce this burden, ELECTRICAL WEST editors suggested to the Western Underground Committee that a simple method of costing underground be developed and that future cost discussions be related to this method. The result is on this page.

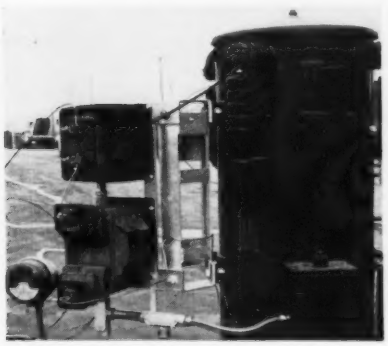
For our part, we will try to include all of these elements in future underground articles so that a minimum of sleuthing will be required to find the root of the improvement. If you wish a supply of this form, a reproduction proof will be furnished on request.

# CLEAN LINES

## Three ideas devised by Western utilities for cleaning up pole-mounted devices

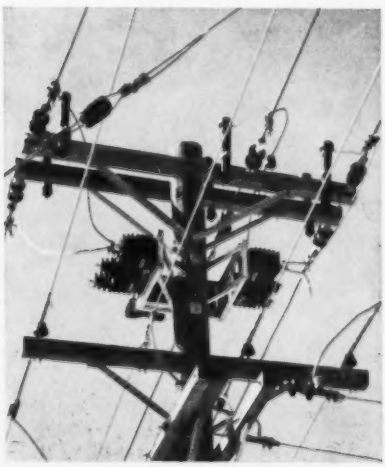


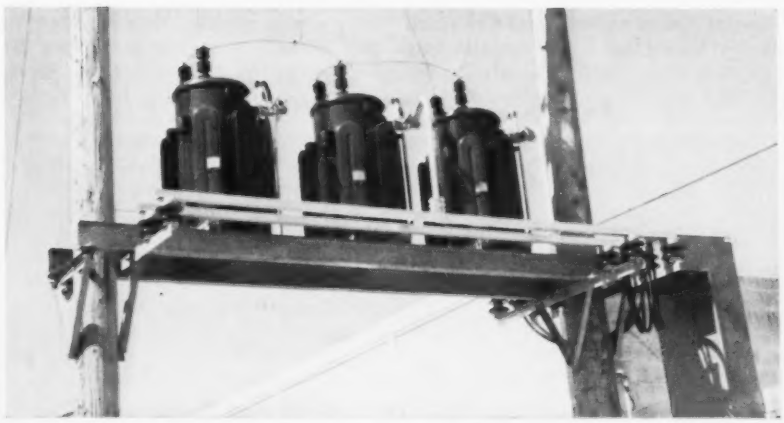
Southern Nevada Power has come up with a clean design for pole mounting its street lighting transformers and associated equipment including photo control and metering



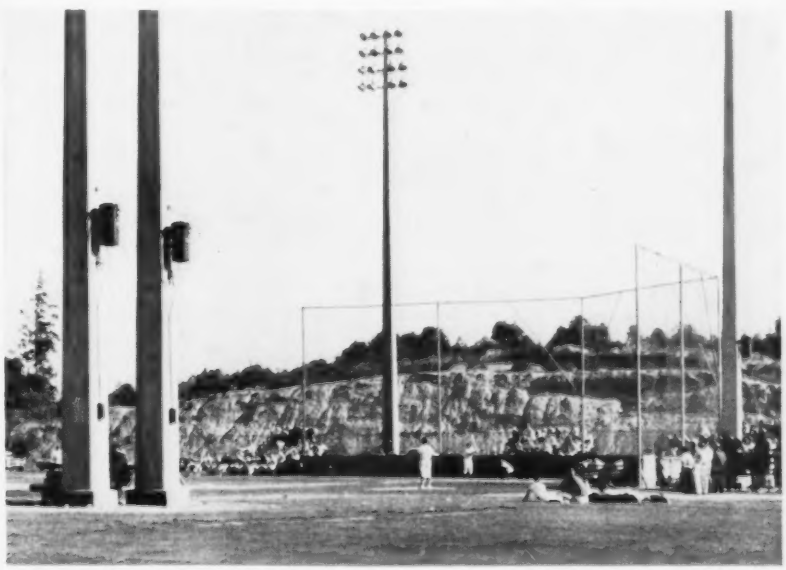
Close-up view of the transformer, potential and current transformers and the photo electric street light control as installed

Neat cluster mounted arrangement of potential and current transformers on a pole used for metering entire lines or circuits





The installation shown here gives one answer to clean, economical secondary busing, eliminating the use of many cable connectors—making a good looking installation. This one was made by the Public Utility District of Grant County, Ephrata, Wash., who reports that it made similar installations of copper and aluminum. Either type was found to be much easier to set up than the system previously used with flexible conductors



City of Tacoma's Heidelberg baseball park lighting installation is switched by the circuit breaker inside the distribution transformer supplying the lamps. As shown the remote-operated hand lines, connected through electrical conduit from the control station at the base of the pole, are connected with the low-voltage circuit breaker handle on the side of the tank. The remainder of the wiring is inside the prestressed concrete pole. The system gives 42 f-c at the batter's box; 36 at the pitcher's mound; and 15-25 in the outfield

**Hockey, fights, conventions, meetings, big shows, exhibitions, a circus—you name it, and the new Portland Memorial**

# COLISEUM CAN TAKE IT

Wrap a glass wall around a "floating" bowl and how do you light the strange thing? For in essence that is what the new Memorial Coliseum in Portland is—a precast concrete stadium bowl around which the modern architects, Skidmore, Owings & Merrill, have wrapped a glass wall and topped it all with a cover held up by four pillars.

The answer might well be "skyhooks," that pat answer construction men usually give to such a problem. It is just about what Grant Kelley & Associates, electrical consulting engineers, and J. Donald Kroecker & Associates, mechanical engineers, of Portland, did with success in this unorthodox structure. The architects are noted for buildings that seem eager to take off from the ground, to give the impression of floating in air, as does their Crown Zellerbach Building in San Francisco.

The Portland Coliseum, now finished and in use, located across the Willamette River on the east end of the Broadway Bridge, appears to be a huge flat glass box through whose sides the curved bowl of the sports coliseum arena can be seen floating.

But because the function of the building is to provide an arena in which public spectacles, games, events, concerts and conventions may be held, that function requires a high degree of see-ability and hence plenty of light. By daytime it might appear that the window walls would provide sufficient daylight. But even that abundance of daylight can be a problem, for it seldom falls where it should or with the desired control. Paradoxically, an ingenious enclosing blackout curtain is employed to control it. Furthermore, it is for nighttime events that the auditorium is used most. For such events, an electrical system of unusual capability is provided in the installation made by W. R. Grasle Co., Portland electrical contractor, who was on the job with an average of 20 men for a year and a half.

That it virtually hangs from "skyhooks" makes it the interesting answer to the problem posed by the architects. However, the lighting and sound systems concentrated in the "cover" over the arena are by no means the total electrical installation. The coliseum has integral with it a large exhibit hall, largely, by contrast, underground, its roof being used for a parking area. There are also eight meeting rooms, holding from 100 to 1,200 persons, located under the arena bowl. Facilities for electrical service and sound and communications for trade shows and expositions in this underground annex to the coliseum and these meeting rooms are of interest as well.

In designing the electrical system among the many considerations were two primary ones: (1) Ample capacity for lighting and ventilation needs and (2) uninterrupted power supply under any circumstances. With this in mind, the coliseum is supplied from two primary sources to two vaults by Portland General Electric Co. Service at 11.5 kv comes underground from two separate substations. One is station L. This source is connected to the "steam generation" bus. Although most power comes from hydro sources, this bus is interconnected to the steam plant floating on the line for emergency. The other is on a hydro network bus. Interconnecting is an automatic transfer switch at the main switchboard in the building. No auxiliary isolated plant was considered necessary because two separate transformer banks assure continuity even should a failure occur on either.

The main arena vault contains three 750-kva, 11,000-277/480-v transformers and two 750-kva, 11,000-120/208-v transformers. The second vault for the exhibit hall contains 750 kva, 11,000-277/480 v for lighting. Since the emergency lighting would normally be on 277/480 for each building, an autotransformer of the dry type is used on a transfer switch to derive the 277 v from the 120-v system.

Ample space has been allowed for future additions in both transformer and switchboard capacity.

Bus duct is used for distribution from the main boards both to the arena and to the exhibit hall.

Since practically the total lighting of the arena building must come from above, this required distributing the weight of the power and control equipment under the lightweight covering roof in some satisfactory manner. There were no walls to go up with conduit or bus duct since the wrap around glass walls have no space in them for such facilities.

The roof itself rests on four concrete pillars 15x18 ft in cross section set back 45 and 60 ft from the outside curtain walls. It was decided to use the shaft inside one of these pillars as a riser shaft for a 2,000-amp bus. Control circuit conduits are run up each of the other pillars. Each of these pillars contains ladders and landings by which operating personnel can climb to the grid of catwalks suspended on rods from the roof truss structures. One of the pillars contains a man lift. The catwalk grid drops below the roof some 20 ft and is 60 ft above the arena floor. The 247x120-ft arena floor itself is at the basement or ground level, whereas the concourse and entrances to the arena are at the parking lot level. The arena building is 360 ft square and the roof 97 ft high.

All lighting remote control panelboards are located on eight platforms just off the catwalks and likewise suspended from the roof trusses. The main remote control and patch panel are on another platform. To reduce weight as well as to distribute it and likewise to eliminate long lighting circuit runs, this arrangement was devised. The new silicon controlled rectifier units, which are basically oversized transistors, are used on the dimming circuits and operated remotely from a console that is located at one end of the bowl itself at the upper spectator level. The silicon controlled rectifiers weigh very little compared to older vacuum tube types.

The lighting control console is of

the latest Century miniaturized type which employs low voltage circuits for silicon rectifier and relay control. The operator can take over the entire arena lighting and sound from that position and lock out other control positions. All sound equipment control is likewise centered at an adjacent console. Circuiting for a remote control console was installed for use when a stage is set up on the arena floor.

Suspended 2 ft below the catwalk grid, also on rods, is a removable false or reflective ceiling which likewise acts as an acoustical control. It is made of perforated corrugated aluminum sheets back of which a layer of glass wool is laid. Sections of this ceiling are left open at the catwalks. From these catwalks the entire arena lighting is done by means of 236 spot and flood 1,000-w bipost lamped units directed at an angle downward to the arena floor. These are circuited for three-color circuit control and for one-third, two-thirds and total of the lighting, but each unit is individually wired to a preset electric panel which permits any group of spotlights to be selected on any control setup. Likewise, each floodlight is individually adjustable and is equipped with color frames for color screens.

There are 16 supplementary spotlights which can be placed wherever desired to supplement the fixed

**Portland Coliseum arena set up for basketball with portable floor in place. Blackout curtain is up. Arena lighting units and sound speakers visible through apertures in reflecting acoustical ceiling. Speaker banks on platforms below it, also follow-spot platforms**

lighting. These provide extra lighting of the portable stages that can be set up at either north or west arena sites or to a boxing ring. These too have color frames and in addition adjustable iris for dimouts. These can also be operated from the console switchboard.

By presetting of selected floodlights a new and better means of lighting can be provided for the arena or a boxing ring. Instead of coming straight downward it comes at an angle from four sides. This gives front lighting of the contestants and hence better visibility of them than from downlight alone. However, extra downlights are concealed in the score board above the arena center, also suspended on cables. Lighting levels sufficient to permit TV cameras to cover all types of sporting events without any supplementary lighting equipment that might impede the view of the spectators are thus provided. An average foot-candle level of 100 was designed for over the entire arena floor. For the boxing ring as high as 200 f-c can be provided.

Seating areas are lighted from 56 recessed RB-52 reflector type lamps of 500 or 1,000 w. These are recessed in the ceiling above the seating area. These, too, are controlled either from the arena console during shows or by remote push buttons at panels at various floor locations.

Speakers for the sound system are suspended on platforms through ports at each end of the arena and center of the ceiling. For a distribution system of low level sound around the arena speakers are also mounted above the false ceiling and sections of the ceiling panel removed below them.

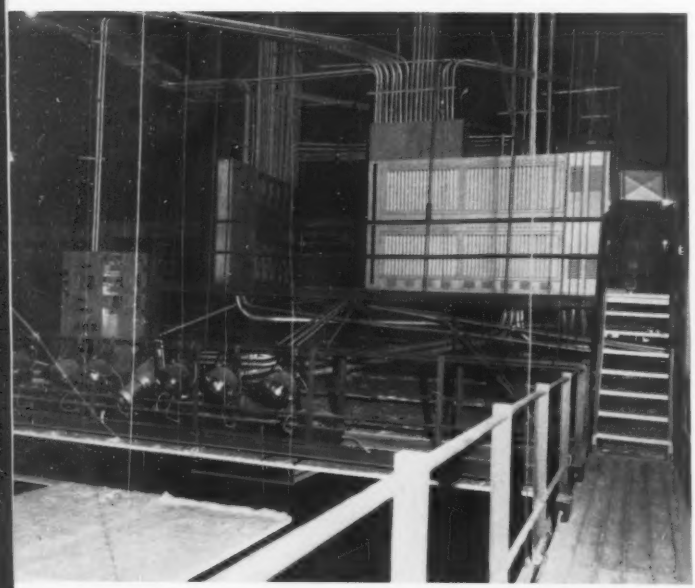
For follow spots eight platforms are suspended below the ceiling 9½ ft around the outside edges of the arena. On each of these is located a Genarco follow spotlight, a direct current arc light unit equipped with multiple color frames and adjustable iris control. These are operated manually and hence are reached by the operator from one of the catwalks above by means of a ladder. Two more platforms are provided for two future spots.

Control circuits for the arena work lights, concourse, perimeter downlights and concourse fixture uplights operate mechanically held contactors which are not a part of the arena lighting control. They are wired through lockout controls provided at the arena lighting console so that the console operator may make these cabinet controls inoperative.

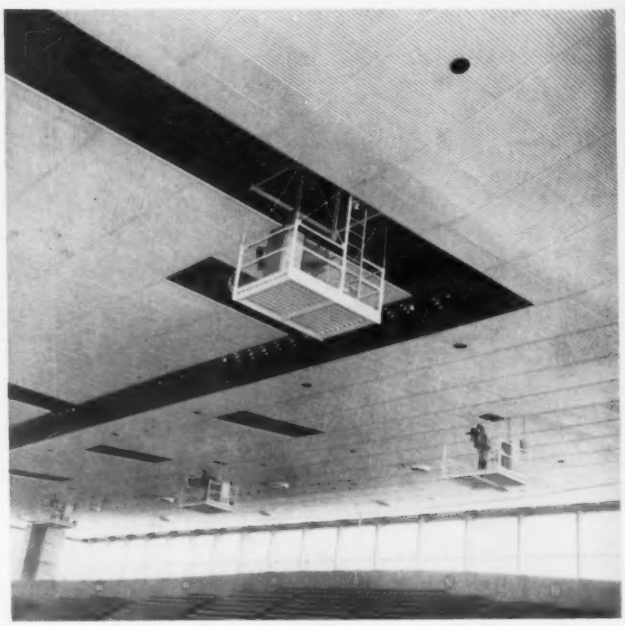
### Powering the Exhibit Hall

To supply the exhibit hall, 450x 134 ft in size, a total of 53,000-sq-ft exhibit floor area, a run of 800-amp, three-phase, four-wire, 120/208-v bus duct along the entrance end serves as a main source of supply with 400-amp lateral bus duct radiating from it every other bay. The latter is of the plug-in type so that exhibitors may receive power at 120/208 anywhere on 24-in. centers in the exhibit area from a circuit breaker disconnecting tap. The bus duct is 15 ft above the floor level, with the bottom of the joists, allowing ample space for high exhibits.

Double cable trays are run parallel to the bus duct runs to carry all of the low-voltage circuits for sound, TV and telephone and likewise pipes for air, vacuum, gas or water for exhibits. Likewise, a TV receiving antenna system is carried in these cable trays, making a tap



**Main lighting panelboards served by bus duct up one pillar, on suspended platform next to catwalks, to whose rail flood and spot lighting units are clamped, fed through 4x6-in. steel channel on catwalk deck equipped with theater-type receptacles for lighting unit plugs. On platform are main patch panel and control panel while one of eight subpanels for individual light control is seen on side of catwalk. One section of acoustical ceiling in foreground**



**Daytime inside the coliseum with blackout curtain down, shows follow-spotlight platforms below aluminum reflecting false ceiling, house lighting downlight ports, ventilating air exhausts, and through the gap left in the ceiling the floodlights along the catwalk. Area low intensity sound ports also seen**

to the antenna system available in all halls and meeting rooms. All of the meeting halls are wired for closed-circuit TV over the telephone company line. Conduit and receptacles have been installed for circuits to broadcast TV from the exhibit halls as well as the coliseum.

Lighting of the exhibit area is done with two-lamp, high output lamp fluorescent strip fixtures, 15 ft on centers, suspended on ¼-in. rods attached to precast inserts. All conduit for the lighting runs is supported on channel fittings. The beams holding the roof of the exhibit hall were all of prestressed concrete and permitted no runs of conduit. However, inserts were cast into these beams to support the raceway system and lighting, ventilating and plumbing equipment.

A feature of the cable tray system is that it is suspended on T supports from the center of the trays, thus permitting laying in of cables from either side without obstruction of any supports. The major distribution cable trays are 12 in. wide and run along the ends of the exhibit area. Two 4-in. laterals run at right angles to serve the individual exhibit spaces at each bay.

After the building was under construction a $40,000 electronic organ, a Rodgers unit made in Hillsboro, Ore., was included in the plans. It is a system with transistorized tone generator working on eight simultaneous signal channels to power amplifiers. There are 18 audio power amplifiers to feed 18 speaker banks. The entire assembly, including the mounting platforms and supports, weighed some 7,000 lb, much of which was also hung on "skyhooks" as was everything else.

So much glass — 80,000 sq ft of it — while beautiful to look at or through — poses problems for the lighting, sound and air conditioning. It can admit too much glaring or distracting light from outside. Its hard surface can bounce back sound. It can admit or leak out heat from or to the outside.

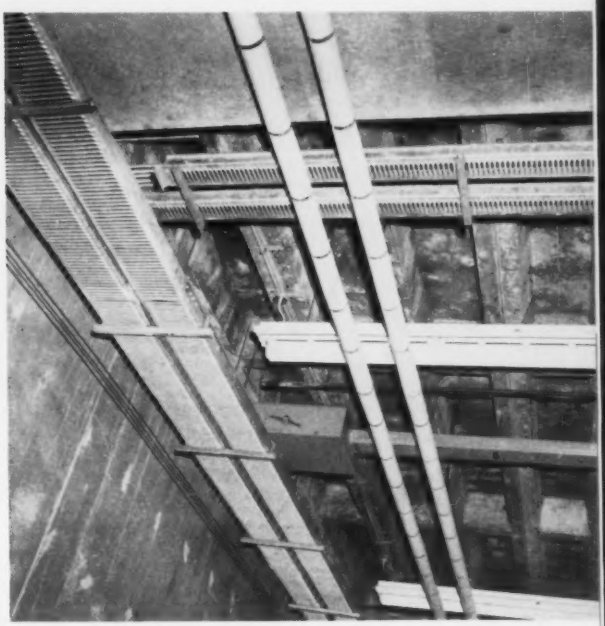
To control these factors another system is suspended from "skyhooks" too. It is a 1,060-ft continuous blackout curtain of fire resisting treated fabric which can be raised or lowered around the entire bowl in 90 seconds from a push-button control on the console. The curtain drops into a slot at the back of the last row of seats. Attached to it at intervals are 105 steel 3/16-in. aircraft cables. These rise to the ceiling area over ball bearing pulleys and are gathered to terminal strips which are electronically synchronized to pull all the cables simultaneously from two 15-hp motors. Lugs fastened to the cables pick up the curtain sections at the required time.

The portable stage curtain rigging is ingenious too. But it is all assembled and operated from the floor. It and the stage itself can be assembled and disassembled for storage.

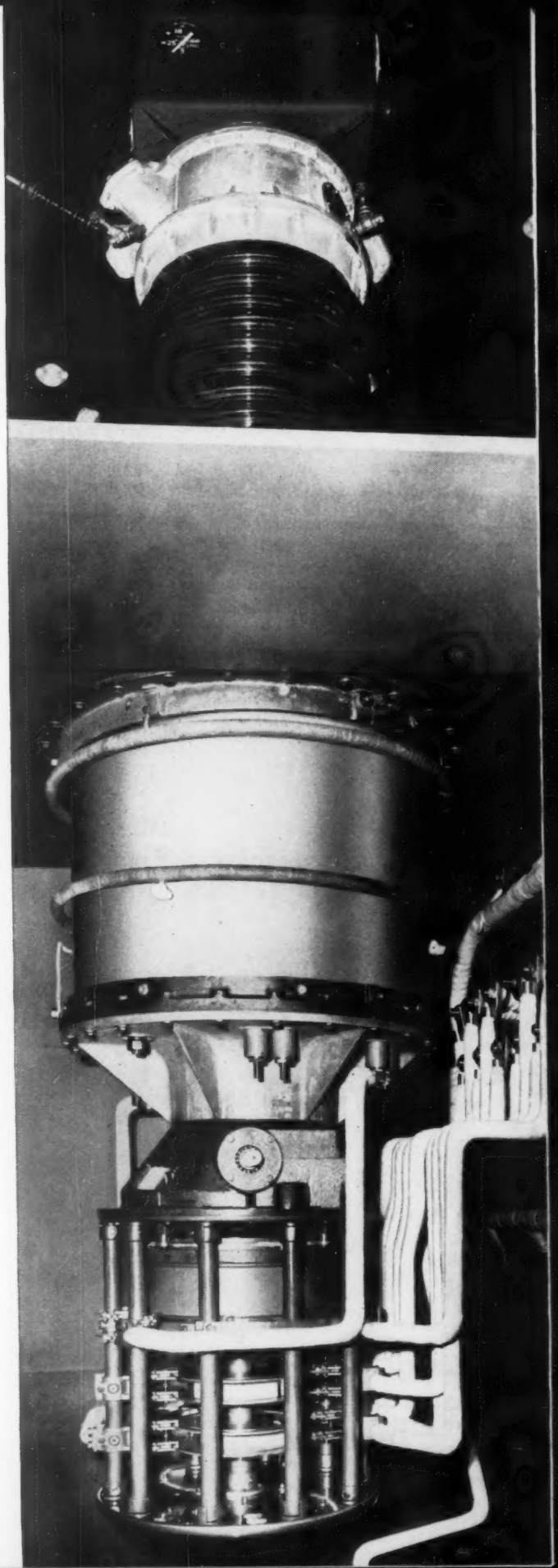
Air conditioning for both coliseum and exhibit hall, while independent, are ingeniously linked through a master control panel that gives versatile use of hot water from 20,000 Mbh of boiler capacity and chilled glycol and water from 240 tons of refrigeration effect to heat or cool individual areas. The refrigeration system is also used to freeze a 1-in. layer of ice over the arena concrete floor for ice skating or hockey. Heating of water through the same floor coils melts the ice in two hours to clear the arena for other usage. This system was designed by J. Donald Kroeker & Associates.

**Main coliseum lighting console with chief electrician, Jim Patrick, at the miniaturized controls, which can be banked in any combination for master switching. House light control is also taken over here. Companion master sound control console is just beyond the lighting console**

**Exhibit hall power is available anywhere from a grid of bus duct; communications from similar grid of twin cable tray. No conduit was permitted in prestressed precast roof sections so it is racked on channel bolted to inserts, which also are used to support ducts and trays**



new URH high-voltage load tap changer on 200 mva transformer reduces weight 10%, length 25%, losses 15%



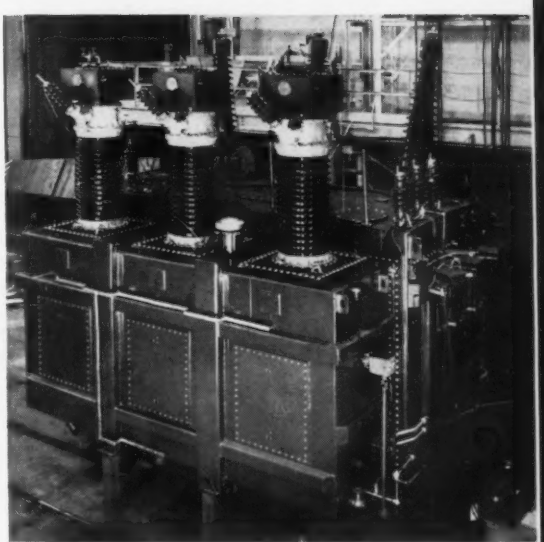
Here is how to reduce shipping weight and size, and improve efficiency, in high-voltage power transformers.

The new Westinghouse URH High-Voltage Load Tap Changer is designed for line voltage operation; eliminates the need for a series transformer. It also eliminates the preventive auto-transformer. Instead, a transition resistor is used, keeping current and voltage in phase for better arc interrupting conditions.

Its in-phase resistance-type transfer switching contributes to extra long contact life.

It's always on position, no matter where it stops in a tap change cycle.

With the new Westinghouse URH High-Voltage Load Tap Changer, the 200 mva transformer shown here has been reduced in weight, size and losses as compared with units utilizing conventional high-voltage load tap changing equipment. You can make similar savings on other sizes of Westinghouse power transformers. Ask your Westinghouse representative for details; or write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pennsylvania.



**This 200 mva Westinghouse transformer** is the largest in the U.S. with resistance-switched high-voltage load tap changer. Shown on test, it is now installed at the Gardenville, N.Y., station of the New York State Electric and Gas Corporation to step down voltage from 230 to 120 kv. J-70955

YOU CAN BE SURE... IF IT'S **Westinghouse**

*For phone number of closest representative see advertising index in back of book.*

**The nearsighted MISTER MAGOO says** . . . "1945? Who could forget that year? Eagle-eye Magoo was mustered out of the Aircraft-Spotting Command, and General Electric invented the slimline lamp. Happy birthday, Slimline! Zounds —they don't make these telescopes like they used to!"

# 3 reasons why General Electric Slimline is America's most popular 8-foot fluorescent

Any time you see a long, unbroken line of fluorescent light, chances are good it's a General Electric Slimline lamp. Over the years, the G-E Slimline has proved . . .

1. *Your customers can cut parts maintenance almost in half.* A G-E Slimline system has about half as many parts as a standard 40-watt system, yet it produces the same amount of light.

2. *Your customers get 5% higher efficiency* from General Electric Slimline lamps than from standard 40-watt fluorescents. They get more light for every dollar of electricity.

3. *Your customers can make their places look better.* Slimlines start instantly, with no blinking. They have an excellent record of uniformity and long life because of General Electric's outstanding quality controls and manufacturing experience. Available in all popular colors.

There are 14 combinations of tube length and diameter to fit anyone's space requirements. Recommend General Electric Slimline lamps on your next job. General Electric Co., Large Lamp Dept. C-13, Nela Park, Cleveland 12, Ohio.

*Progress Is Our Most Important Product*

GENERAL ELECTRIC

*For phone number of closest representative see advertising index in back of book.*

ELECTRICAL WEST
APRIL 1961

# CONTRACTING & CONSTRUCTION SECTION

STATISTICS / COSTS / PROPOSED PROJECTS / NEW PRODUCTS / NEWS

## LATE NEWS FLASHES

### Can Advertise as Electrician for Wages

In an opinion given by California's Attorney General Mosk, although amendment to the state contractors license law passed last year provides penalties for those who misrepresent themselves as contractors in advertising, a person may advertise as an electrician for wages only. If he agrees to perform work other than on that basis he may be required to have a contractor's license. The opinion was asked for by John Chadwick, registrar.

### EASA Management Seminar in Portland

One of four seminars on management of an electrical motor and equipment service shop being given in a national series is to be held at the Multnomah Hotel in Portland for the Oregon Chapter of Electrical Apparatus Service Assn. (formerly NISA), April 20-22. These seminars, conducted by faculty members of St. Louis University's School of Commerce, cover in three days the scope of management problems, organization, personnel and relations.

### Inspector Meeting Dates Changed

Nevada Chapter, International Association of Electrical Inspectors, will meet at Hotel Nevada, Ely, May 6 instead of April 22, Andrew Ulrich Jr., chairman, announced. Date for Utah Chapter annual meeting will be May 8, in Salt Lake City. Idaho Chapter will forego its annual meeting until the Northwest Section meeting in Boise, Sept. 11-13, at the Owyhee Hotel.

► **District 8, National Electrical Contractors Assn.,** held an informal meeting at the Cosmopolitan Hotel, Denver, recently presided over by Charles Berrell, vice president. Principal item on the

*Continued on page 94*

Page 102 NEW PRODUCTS
112 ESTIMATOR'S GUIDE
108 PROPOSED WESTERN PROJECTS
100 READER SERVICE SECTION

Garrett in Joseph Magnin main store sportswear shop he relighted by a luminous ceiling

## THE CONTRACTOR'S MARKET FOR LUMINOUS CEILINGS

is well illustrated by this example in a case typical of the merchant of style goods anywhere. His need is to light up the color and style of his wares to make them enticing to the woman purchaser without distracting her by obvious, bright light sources. The merchant is not interested in what does it, only in results. To the electrical contractor, lighting equipment is a tool by which to satisfy his merchant client's needs. Available to him is a wide variety of electrical, plastic and acoustical equipment he can combine to deliver his client a complete satisfactory package of light. At least 100,000 Western stores can profit from such creative selling.

# A LUMINOUS SOLUTION

### for a low ceiling in a smart and stylish dress sales room

The Joseph Magnin main store at San Francisco had a second floor difficulty. That difficulty was its low ceiling. How to make the colorful sports dress shop on that floor really attract women customers up the stairs or elevator to shop there called for some way to light it gaily without obviously doing so. What was wanted was a sunny atmosphere in which to display colorful sportswear without the glare of the sun or its electrical substitutes.

Wen Garrett of Republic Electric, San Francisco (the man on the cover), provided Cyril Magnin, owner, with a solution that pleases everybody. It is a low brightness luminous ceiling that is not obvious but which puts 160 f-c on the merchandise, measured two feet from the floor.

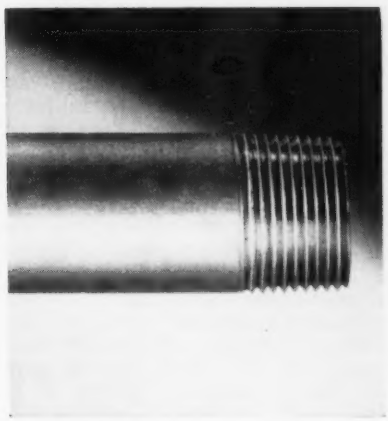
"We removed a ton of old wiring and fixtures that had accumulated over the years," Garrett said.

To meet this particular problem a polystyrene translucent plastic Cylindricell ceiling was selected because its design of tangent circles was pleasing, diffusion of light good and installation simple. The plastic panels, which lock together with nylon clips, are suspended 8½ ft from the floor. It is supported at the center of each 2x2-ft panel by a threaded nylon tong hanger that goes through a center hole unobtrusively. The hangers are attached by a rod of running thread to a toggle bolt in the ceiling, making accurate adjustment for leveling easy.

Striations from the fluorescent lamp strips on the ceiling, on 18-in. centers in the shallow plenum, are evened out by mounting a variable thickness diffusing plastic shield under the 4-ft cool white lamps. These also prevent direct view of the lamps even from directly underneath and they eliminate reflective or specular glare.

To relieve the possible monotony of the continuous luminous "sky" and to add decorative color Cyril Magnin imported the circular Venetian glass bowls, lamped with a 150-w incandescent bulb, which were suspended close to the cellular panels. Over some display cases a perimeter cove was installed and some circular down lights.

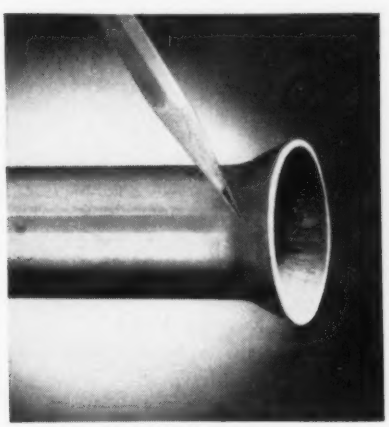
# 6 ways you benefit when you install ROME RIGID STEEL CONDUIT



**EASY CONNECTING.** Rome rigid steel conduit exclusively is **hot dip** zinc-coated by the Sendzimir process after threading. Threads are clean, sharp.

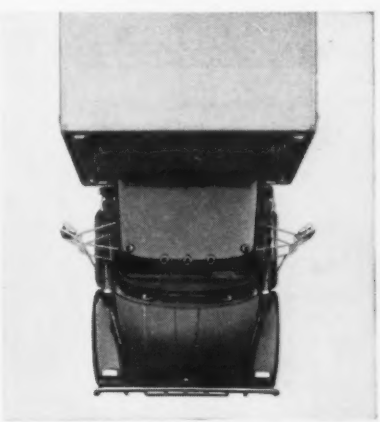
**EASY BENDING.** Uniformity of the conduit wall, due to **controlled annealing** before galvanizing, makes Rome conduit easy to bend accurately.

**EASY SIZE IDENTIFICATION.** Each length is identified by color-coded, size-imprinted thread protectors . . . and, in addition, the size is imprinted on the tube itself.



**UNBREAKABLE WELD.** Uniform edges, bonded by electrical resistance welding, form a weld stronger than the pipe itself.

**EASY HANDLING.** Conduit is shipped in one-ton bundles, subdivided into smaller bundles for easy handling on the job site.



**CONVENIENT DELIVERY.** Fast, efficient shipment to the job site from your nearby Rome Cable electrical distributor.

For more information on Rome rigid steel conduit, write for Bulletin RCP-940, or ask for a sample. Rome Cable Division of Alcoa, Dept. 4-41, Torrance, Calif.

ALCOA
ROME CABLE
DIVISION


*For phone number of closest representative see advertising index in back of book.*

# NEW PLANT ELECTRICAL SYSTEM

## Standard Oil Co. of California revamps its electrical system to give the dependability demanded to keep vital functions going

R. A. WEIMER, SUPERINTENDENT UTILITIES DIVISION, RICHMOND REFINERY, STANDARD OIL CO.
F. K. FOX, APPLICATION ENGINEER, GENERAL ELECTRIC CO.

Recently a new improved electric power system went into service at the Richmond Refinery, and operating results to date have fulfilled all expectations. A brief review of the features of this new system should be of value to any large industrial plant designer and to the power company serving it, especially where the existing system is reaching maximum capacity and is about to be expanded.

The new system was designed to produce the following benefits:

1. Greater reliability. This is heard every day, but in terms of refinery operation it means fewer forced shutdowns of vital process plants.

2. Better voltage conditions. This means fewer motor burn-outs and more efficient operation of lighting and other electrical equipment.

3. Reduced losses in utility supply lines. This is a definite saving to the power company.

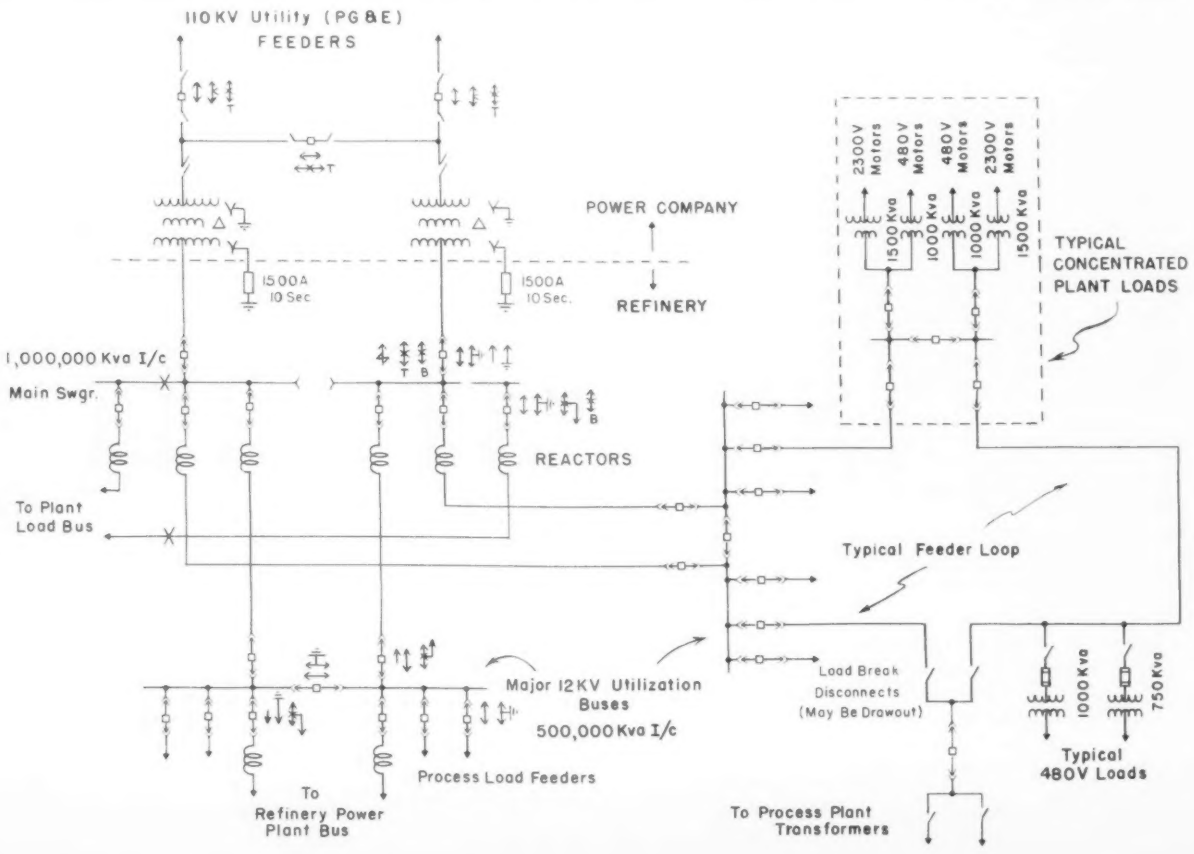
4. Better relaying. When faults do occur, less operating equipment will be affected.

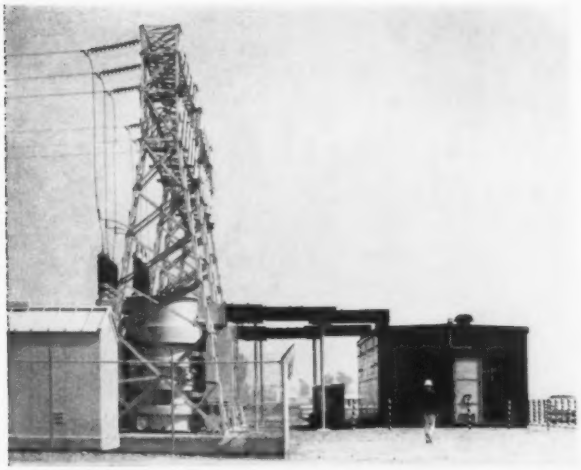
5. Provision for future expansion in an orderly manner. This avoids the alternate method of "growing like Topsy" with all its headaches.

6. The probability of complete loss of power company supply has been reduced to a minimum. However, should this happen, underfrequency relaying has been provided which will "cut loose" the power company system and drop interruptible refinery loads. This will enable the refinery power plant to continue to operate the more essential process units within the capacity of its own electric power generation.

Located on San Francisco Bay, where it receives crude oil by water and pipe line, the Richmond refin-

**To the professionals, this one-line diagram tells the story at a glance of the well-planned refinements that went into the system**





Two 60,000-kva transformers feed the refinery operated main switchgear through 12-kv buses. Two 12-kv neutral grounding resistors between the fence and the switchgear are each rated 1,500 amp, 10 second, limiting refinery ground faults to 3,000 amp

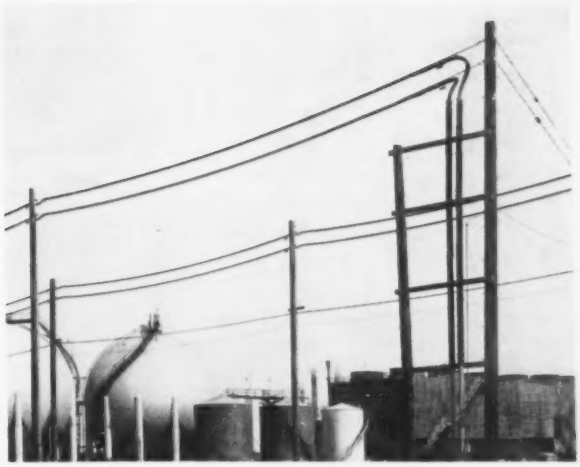


Photo shows typical overhead cable construction used where refinery pole space was at a premium. Each 1,000 amp, 20,000-kva line here consists of two sets of three one-conductor, PILC, neoprene jacketed, 500 mcm cables, wrapped to ½-in. steel messengers

ery was started in 1902. By 1935 its electrical load had grown to approximately 3,000 kw, at which time the initial power plant was built consisting of three 5,000-kva, 2,300-v generators.

By 1948 the load had grown to approximately 20,000 kw and an additional 9,375-kva, 12,000-v generator was added. Until this time, the power company tie was by 12-kv overhead lines from a substation about six miles away. Maximum power company demand was approximately 10,000 kw.

As the load increased, the power company built a large substation about two miles from the refinery in 1950 to handle this and other loads in the area. Service was still by 12-kv overhead lines, and by 1958 the refinery load had increased to approximately 55,000 kw, requiring more 12-kv lines to handle a purchased power demand of 35,000 kw.

Transmission of this amount of power over two miles of 12-kv line is not economical. Also, it was known that the load would increase even more, and today the total refinery load is around 67,000 kw.

So, a new system was designed jointly by the power company (Pacific Gas and Electric) and the refinery, calling for 110-kv lines to come into a new substation located near the center of the refinery area.

All the features of this new system were determined on an a-c network analyzer board in Schenectady, N. Y., before construction began. This study gave accurate information regarding what the proper transformer ratios should be; what actual need existed for load tap changing equipment; what the actual operating results would be; and what system components would be required in the way of switchgear, reactors, lines, relaying, etc.

The system arrangement and relaying is shown in Fig. 1. Good relaying is an essential element of any well designed power system, and in this one it has been possible to obtain relay settings which produce complete selectivity.

One problem given major consideration in the design of this system was that of underfrequency conditions resulting from loss of purchased power. Experience shows that low frequency has accompanied practically all system disturbances that have resulted in load interruption. This is true for small industrial systems which lose a utility feeder, as well as for large integrated power systems. Rapid operation of certain breakers in the system can provide planned power system separation so that process disturbance is minimized, by bringing essential load in balance with generating capacity.

RELAYING SYMBOLS

- Differential (L=Line, T=Trans., B=Bus)
- Pilot Wire Line Differential
- Current Balance
- Phase Overcurrent
- Ground Overcurrent
- Directional Phase Overcurrent
- Directional Ground Overcurrent
- Sensitive Power Directional with approx. 5sec. Time Delay

*All breakers shown are operated normally closed.*

Table to left gives the symbols for the extensive relaying shown in the one line

### Speed Required to Resolve Loss of Utility Contribution

Fig. 2, Curves B, C, and D, give a reasonable indication of the initial rate-of-change of frequency plotted against time while a steam turbine-generator is subjected to various per-unit excess loads. These are approximate curves based upon typical load inertias, constant-torque load, no governor lag and no change in steam pressure. Lag in governor response will cause a greater rate of change of frequency. A load with characteristics other than constant torque may tend to unload the generator, causing a lower rate of change of frequency. This is quite likely in a refinery where so many loads are centrifugal pumps or blowers whose torque varies as the square of the speed. Direct displacement pumps and compressors are constant torque loads. Lighting and electrical heating loads are quite likely to represent constant torque loads.

Generation terminal voltage will take a sudden dip depending upon the amount and power factor of the sudden overload. Voltage regulators will attempt to hold voltage up to the ceiling voltage of the excitation system, but terminal voltage will decrease with time because of reduced frequency.

**When the frequency dropped in the old days, often "George," the pump house attendant, was the only one who noticed it**

It is apparent from these curves that when local generation is subjected to any considerable overload, corrective measures must be taken quickly and automatically to avoid disastrous random shutdown.

### "George" the Human Underfrequency Relay

The following story demonstrates what can happen. Several years ago, at the time of this incident, the conditions were as follows:

| | |
|---|---|
| **Total refinery load** | **30,500 kw** |
| **Total generation** | **22,000 kw** |
| **Incoming from utility** | **8,500 kw** |

Both incoming lines were accidentally opened at the power company end so that no reverse power flowed, no refinery breakers tripped, no alarms operated and no one in the refinery was immediately aware of what had happened.

No one, that is, except George, who was an operator at a comfortable, quiet pumping station. He noticed a change in sound that "occurred quite rapidly—in about two or three seconds." He called the power plant and said, "Sounds to me like the pumps have slowed down a little. Is everything okay?" The power plant operator saw that the frequency meter was off scale (below 58 cycles) and immediately dropped sufficient load to restore the normal frequency. The entire process required about 3½ minutes.

When the utility contribution was lost, the generators were overloaded by approximately 0.4 per unit (140% load) and immediately started to decelerate at a rate of about three cycles per second. As the system slowed, it unloaded itself so that the actual deceleration (as shown in Fig. 2, Curve A) ended at a final stable condition of approximately 54 cycles. System voltage dropped approximately 6%, and the turbine-generators were able to carry about 22,800 kw at this reduced frequency and voltage for about 3½ minutes without difficulty. Based on the fact that the system unloaded 7,700 kw due to speed reduction, this load reduction of approximately 25% was produced by a frequency drop of 10% and a load assumed to vary at the 2.75 power of speed (mostly centrifugal pumps). Curve A, Fig. 2, closely agrees with the initial curve B. In the present power system with approximately 70,000-kva total load, it is obvious that unloading by the "George" method would not be possible.

### Present System Frequency Control

On the present system, underfrequency relays are set to operate at 58½ cycles. This produces instantaneous tripping of certain breakers, through auxiliary relays, which separate the utility from the refinery generators and bring the connected load within the capacity of the generators.

Fig. 3 shows the frequency change, beyond the frequency relay setting for three events to occur, assuming a constant system deceleration. Curve 1 shows the system frequency change that will occur while the frequency relay is operating to close its contacts. Curve 2 shows the frequency change allowing for the time required for a five-cycle breaker to open. Curve 3 shows the total system frequency change that will occur, during relay time, breaker time and auxiliary relay time. A 2.0 per unit excess load, which is the present condition, is shown to be controlled by the time the power system frequency reaches 52½ cycles. It is probable that this level would not be reached because the load being mostly centrifugal pumps would tend to decelerate slower than the initial rate (Curve D, Fig. 2). These curves may be useful to the reader in estimating what might be accomplished on his own system with similar underfrequency relay protection. For example, another system having 1.0 per unit excess load—and not requiring auxiliary relays between the frequency relay and breaker—is shown to open the breaker by the time system frequency reaches 56 cycles.

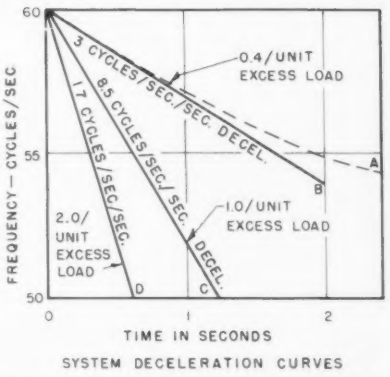
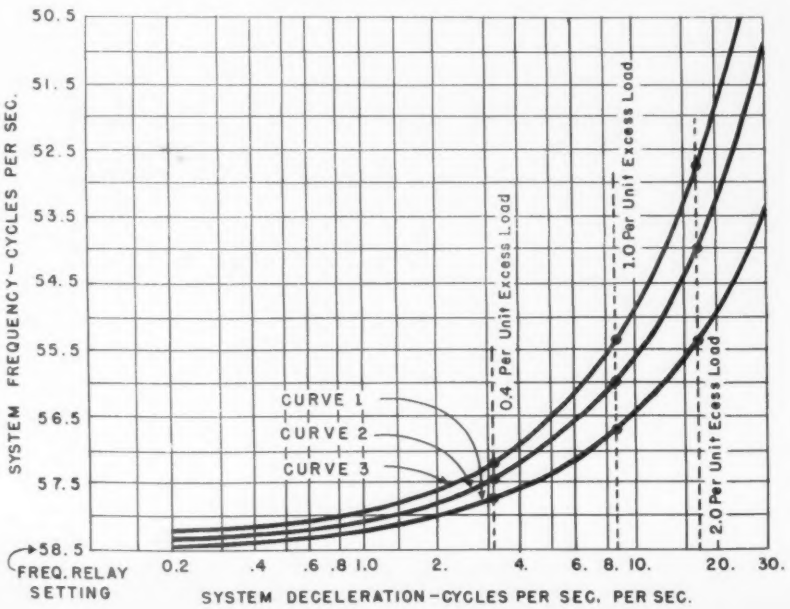
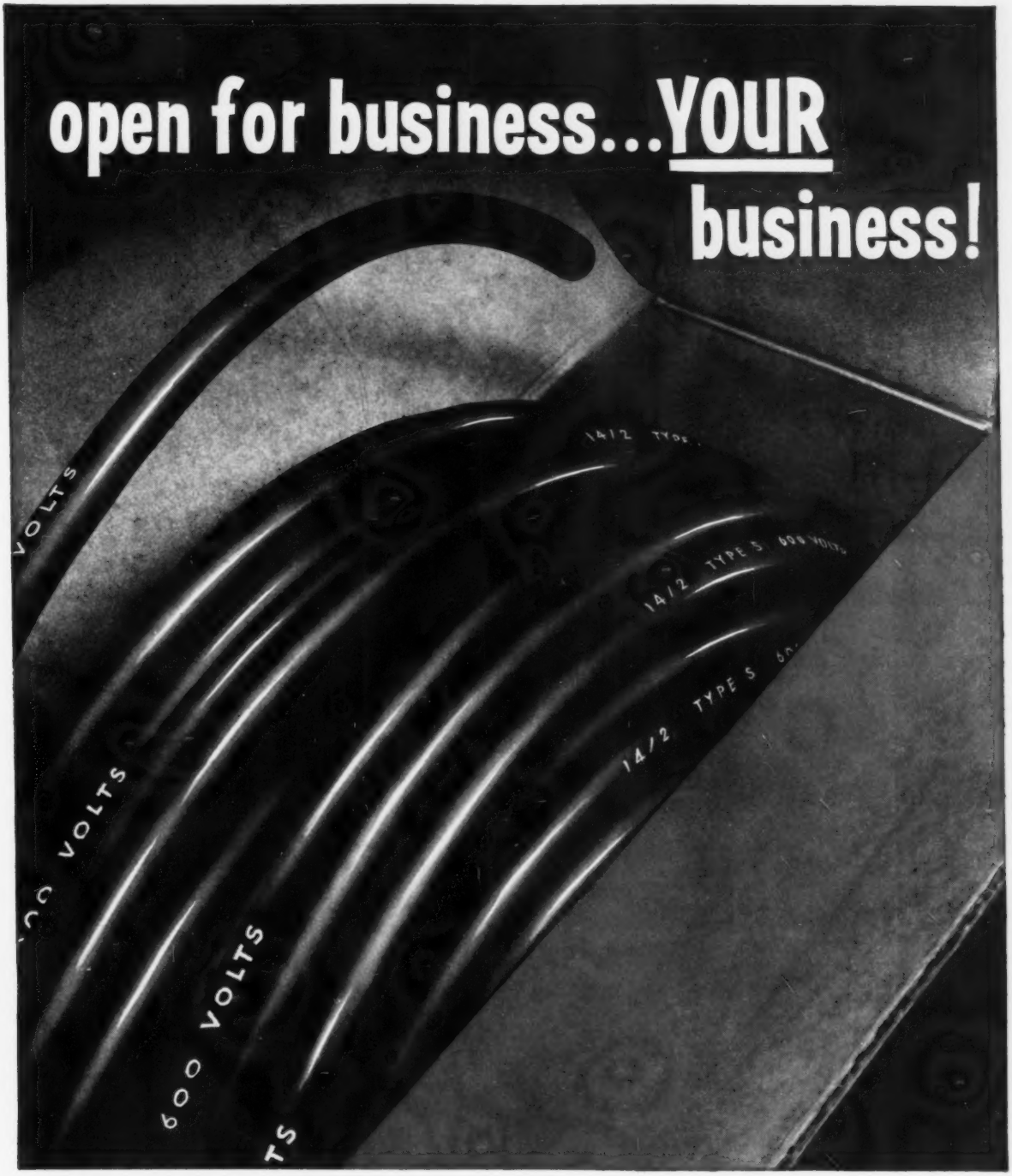



**Fig. 2—Showing the time for system deceleration as excess load is "dumped" onto the limited capacity of the plant generators**

**Fig. 3—Showing the frequency change, beyond the frequency relay setting for three events to occur, assuming a constant system deceleration. Details given in text**






**ROYAL Portable Cords**

work fast and easy . . . make on-the-job wiring safer, surer, and more dependable, too. ROYAL offers the right cord and the right quality at the right price. Whether you're buying rubber, neoprene, or thermoplastic cords — fixture wires — lamp cords — machine tool wires — thermo cables — bell wires — coaxial cables — it's good business to specify ROYAL. Most electrical men do. See your wholesaler, or write for catalog, giving wholesaler's name.

ROYAL ELECTRIC ...an associate of IDEAL

**ROYAL ELECTRIC CORPORATION**
**PAWTUCKET, RHODE ISLAND**
In Canada:
Royal Electric Company (Quebec) Ltd., Pointe Claire, Quebec

*For phone number of closest representative see advertising index in back of book.*

# WHEN MOTORS 'SINGLE PHASE'

TOM HUGHES, CALIFORNIA DIVISION OF INDUSTRIAL SAFETY

## Motors and Controls—XXI

The other mishaps beyond our control are caused by reversing of phases and loss of one phase. Most persons familiar with the use of three-phase motors know that to reverse the running direction you just switch two phase wires. The revolving field excited in the stator winding then goes around in the opposite direction and the rotor follows it. It doesn't take much cogitation to list some possibilities for tragic results if a phase reversal occurred.

Like lightning in the coastal regions of California, phase reversal on the line is a rarity and few outfits take any precautions against its occurring. There are several relays available that can be applied to the service equipment or any feeder. The relay is usually applied to the shunt trip on a main circuit breaker, to trip it the instant a phase reversal is sensed. So this protection is simple, if you want it.

Single phasing is a much harder nut to crack, however. Not only does single phasing produce highly inconsistent results in different situations but it has produced highly divergent views among different segments of the electrical industry. Since too many views are modified by the side one's bread is buttered on, we want to emphasize some observations from our own experience in large railroad ice plants.

We used to have a fuse go out in one phase of a feeder circuit to ice tank motor distribution panels and this would leave groups of agitator motors and other continuous duty motors running single phase. Since this usually happened while ice harvesting equipment was in use, a crane motor or conveyor would refuse to start and the personnel was alerted to the situation. But we never experienced damage to a winding from such cause and rarely did an overcurrent relay trip and take the motor off the line. There is no doubt that continued operation would have opened an occasional relay and burned out some motor windings where other relays didn't open.

Analyzing the internal situation, when a group of motors run single phase from an open feeder fuse there will usually be a mixture of loads and winding configurations in the group. It has been proved that lightly loaded motors in such a parallel network will act as generators and tend to balance up the voltage and currents (to a certain degree) on the network. Of course one motor, by itself, is going to be in trouble on single phasing.

The other factor that takes care of groups of motors in an attended plant is that a certain percentage of the starters will be so connected that their holding coils will be in the open phase and they will drop out. Then the operating personnel will investigate to see what has caused this shutdown. Furthermore, unless the noise level is extremely high a person surrounded by a group of motors running single phase will notice a change in the customary sound of things. The hum level increases very noticeably and the "musical" key changes with slowing down of rotors and loads.

The set of circumstances is found to be essentially the same with a group of motors when a utility company's primary fuse goes out ahead of a wye-delta or a delta-wye bank of transformers. The only noticeable difference is that holding coils are less likely to drop out. In a plant with many loads and attendants on hand there is usually plenty of warning to the personnel that something is haywire.

But, of course, the loaded motors in these groups are taking rough treatment in these circumstances and this is far from the way we have recommended applying motor and controls. So what do we do? In the first place we can use three-pole circuit breakers in our feeders so that one fuse can't blow. At the motors a simple solution is to use dual-element (so-called time-lag) fuses in the branch switches. This use requires careful scaling of fuse size to the load.

For large motors or special motors, where a considerable cost is involved, some engineers use phase-failure relays. A phase-failure relay has to be carefully applied to the individual motor, however. Since it works on the principle of unbalanced currents, with the open phase in the branch circuit, a lightly loaded motor will tend to balance up the currents through the parallel connected relay coils. Motors on the line will act to balance up the currents where the open phase is ahead of the group. And none of the phase-failure relays operates dependably when a fuse opens in the primary of the two transformer hookups mentioned.

A large faction of the electrical industry wants to settle the issue by forcing everyone to use three overload relays in motor starters instead of the normal two. Now, there is no doubt that this is good practice (or shall we say good insurance) for a large well pump, running unattended, on the end of a primary line. The whole industry agrees on this point but the majority of the industry considers it a useless extravagance to consider requiring three units in ordinary industrial plant starters.

One thing that has spurred this controversy is that there have been instances where windings of whole groups of motors were damaged at one time and the utility company had a primary fuse open. It was assumed by persons concerned that the whole thing was initiated by opening of the primary fuse. When an old-timer investigated he would learn that no starter overload relays tripped; that the whole thing happened too fast for relays to have tripped, and that damage from an arcing fault had to be cleaned up on a feeder or in some enclosure before the system could be operated again.

Actually the primary fuse opened from reflected surges caused by the fault in the plant. People often wonder why a primary fuse so often goes out before the secondary main breaker can trip but you must remember that a sudden disturbance in a secondary system—reflected back through a low impedence transformer bank (with a ratio of 440 to 12,000 v)—is swinging a big lever arm.

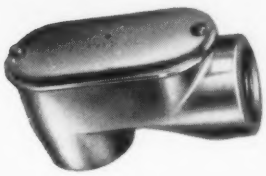
All it takes is a ground fault and the right arrangement of components on a 480-v nongrounded system to set up a momentary series-resonant condition with an enormous voltage step up. Usually a blow up occurs in control equipment but poorly maintained motors can puncture the windings, also. Since resonant voltage step up is a little-recognized phenomenon the

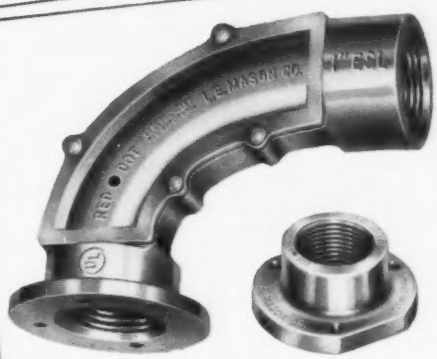
# FROM EVERY ANGLE

# RED ● DOT FITTINGS offer

VALUE
QUALITY
PROFIT

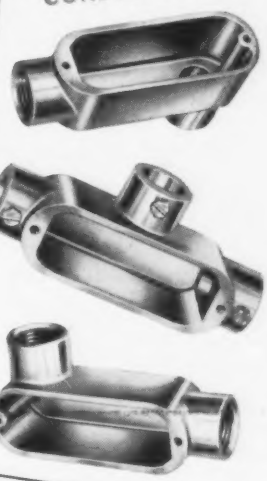
ENTRANCE ELLS



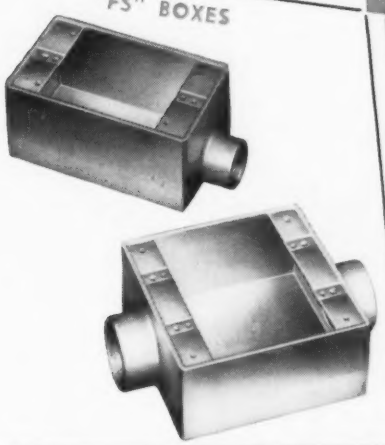


"ELECTRO-SERTS"

CONDUIT BODIES



"FS" BOXES



WITH
EVERY WANTED FEATURE!

- Ultra-Hi Pressure Cast
- Aluminum, Copper Free Alloy
- Roomy, Unobstructed Interiors
- Flat Backed for Snug Fit
- Outstanding Design
- Satin Smooth, Inside & Out
- Adaptable for Every Use

COVERS & CORNER ELLS

WAREHOUSE INVENTORIES CARRIED IN:

ATLANTA
BALTIMORE
BOSTON
CHICAGO
CLEVELAND
DALLAS
DENVER
DETROIT
GREENSBORO, N. C.
INDIANAPOLIS
KANSAS CITY
LOS ANGELES
MIAMI
MINNEAPOLIS
NEW YORK
PHILADELPHIA
PITTSBURGH
PORTLAND, ORE.
ROCHESTER
SAN FRANCISCO

Write today for new illustrated catalog of the Complete RED ● DOT Line.

RED ● DOT EXCELS

Sold only through authorized Electrical Wholesalers

SERVING INDUSTRY Mason FOR 30 YEARS

L. E. Mason Co. BOSTON 36, MASSACHUSETTS

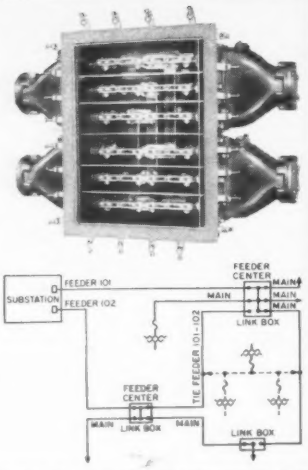

*For phone number of closest representative see advertising index in back of book.*

Make your underground primary system operation
FLEXIBLE with G&W SECTIONALIZING BOXES

Maximum flexibility in planning and operating underground primary cable systems is found when G&W Sectionalizing Boxes are used. Sections of cable can be isolated or reconnected quickly and inexpensively merely by removing or inserting links in the cable boxes. Breaking and remaking cable joints for cable fault location or repair is no longer required. Added bonus is that remainder of circuit can be returned to service during emergency operations.

G&W Sectionalizing Boxes are available for any conceivable number of cables and can be furnished with blank ways for addition of future circuits. All boxes are hermetically sealed and submersible. Standard types are available for operation to 34.5 kv.

Write to G&W for additional information on G&W Sectionalizing Boxes or call the nearest G&W sales representative.



Typical circuit using G&W Sectionalizing Boxes

G&W ELECTRIC SPECIALTY COMPANY
3506 WEST 127th Street • BLUE ISLAND, ILL.
CANADIAN MFR. • POWERLITE DEVICES LTD.
TORONTO, MONTREAL & VANCOUVER

*superior quality standards – inspired specialized design*

8861-1

SPUR production
*with TRI-STATE Profit-Maker Equipment*

The most profitable way for you to increase your electrical-electronic production or servicing is to use dependable, quality winding equipment and tools.

Quality equipment from manufacturers of known integrity provides you with precision operation, long service life and low maintenance costs. Whether it's high speed automatic machinery, or reliable hand tools, TRI-STATE stocks the equipment that will make **your** job easier, faster to produce, and more profitable.

For immediate delivery on winding equipment, soldering pots and guns, baking ovens and tools—plus wire, insulating materials, brushes, bearings, capacitors or commutators—call

*Send for factory catalogs—they're free*

ONE CALL FOR ALL TOP BRANDS
COMECO COIL WINDING EQUIPMENT CO.
IDEAL
Weller
CROWN
HULLHORST UNDERCUTTING TOOLS TOOLS, INC.
PYRAMID INSTRUMENT CORPORATION
GRIEVE-HENDRY
DEE ELECTRIC COMPANY
P. E. CHAPMAN electrical works, inc.

TRI-STATE
SUPPLY CORPORATIONS
Los Angeles 13 • 544 South San Pedro St.
MAdison 8-2354
San Francisco 7 • 554 Bryant St.
EXbrook 2-8890
Seattle 9 • 325 Westlake Ave., N.
MAin 2-4161

power company's fuse usually has to take the blame.

But forgetting all these obvious factors, what about the internal situation of the poor motors subjected to single phasing? There again, hot spots is our big problem. We said that the over-all machine will act as a generator to induce an equal current in the third part of a delta-connected stator winding, as an example.

This state of affairs results from the balance between the induced and counter-emf currents imposed jointly by the stator and rotor upon each other. But, depending on the connections and disposition of coil groups around the stator slots (for establishing poles) there is bound to be uneven heating of coils. Even though three overload relay units are used and the motor is running light, it can develop damaging hot spots before it is taken off the line.

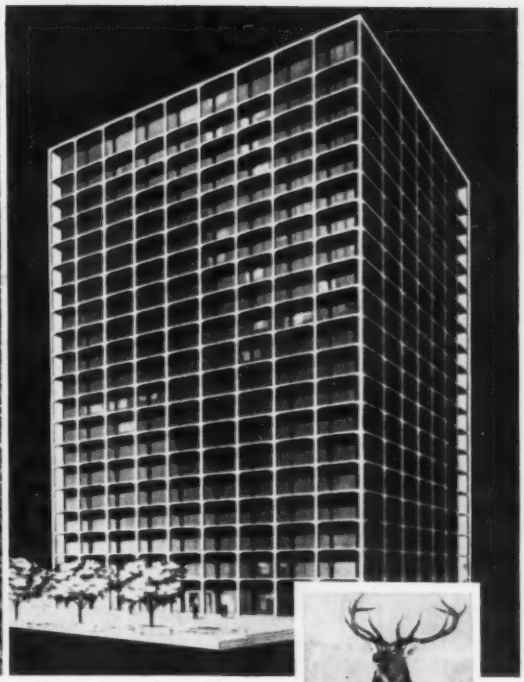
We mention this, in spite of the fact that we said we had not experienced known losses from single phasing in our ice plant tour of duty. We are talking academically in these articles—about normal patterns in electrical performance and aims toward the ideal. There is no rhyme or reason to the things that electricity can do when turned loose and, no doubt, persons can produce arguments or examples from experience to refute most of the things we have said.

## LATE NEWS

*Continued from p 85*

agenda was NECA's new marketing program. The Mountain States Line Constructors Chapter held a meeting in connection with it, according to Floyd Shipp, NECA field representative for Districts 6 and 8. He also told of successful workshops held by the Southern Colorado Chapter, five in all, conducted by Jack Sullivan from the Western Region office. Both Spokane and Puget Sound Chapters also conducted workshops recently. District 6, under Howard Bayley, held a Council of Chapters meeting at Tacoma.

► **25th Birthday of the Electrical Maintenance Assn.** of California was celebrated at its Feb. 15 meeting when nine past presidents and six 25-year members were honored. There were over 60 members of 10- to 25-years-standing present. EMEA was holding its seventh Electrical Maintenance Conference at USC as we went to press. It will be reported in a later issue.



**NEW HARTFORD BUILDING** at 100 South Wacker Drive, Chicago, Illinois, to be occupied, in part, as Western Department Headquarters of Hartford Fire Insurance Company Group. George A. Fuller Company, General Contractor. Skidmore, Owings & Merrill, Architect-Engineer. Emerson-Comstock Co., Inc., Electrical Contractor.

# REPUBLIC RIGID STEEL CONDUIT

## ...lowers cost in high-rise buildings

Republic Rigid Steel Conduit goes in easily, quickly, assures trouble-free service in high-rise construction. That was the story at Chicago's new Hartford Building.

Installation was easy, bending was easy, because Republic Rigid Steel Conduit offers the highest degree of uniformity and ductility. Threads are clean, sharp, free-running. Welds are sound, smooth, strong. Surface is fully protected by a hot-dipped galvanized coating which will not peel, flake, or chip off under normal bending.

Highest quality Republic Rigid Steel Conduit is made of soft, ductile steel—produced by Republic's famous continuous weld process to meet severe service requirements. Fully tested, inspected, approved. Carries the seal of the Underwriter's Laboratories, Inc.

To learn more about Republic Rigid Steel Conduit advantages, call your Republic representative. Or, write direct.

Compatibility and strength characterize raceways made of

Galvanized Steel

**REPUBLIC STEEL**
**STEEL AND TUBES DIVISION**

REPUBLIC STEEL

**Cleveland 8, Ohio**

**REPUBLIC STEEL CORPORATION**
**STEEL AND TUBES DIVISION • DEPT. C-1960**
**216 EAST 131st STREET • CLEVELAND 8, OHIO**

I want to learn more about the advantages of Republic Rigid Steel Conduit. Please send complete information.

Name _____ Title _____

Firm _____

Address _____

City _____ Zone ____ State _____

*For phone number of closest representative see advertising index in back of book.*

# Why a "New" Fisher-Pierce photocontrol like this isn't born every day...

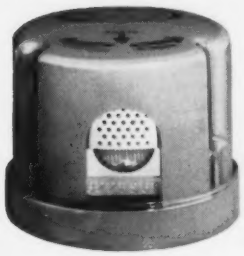
Model 6620

Call it "cautious New England conservatism" if you like, but offering a photoelectric street light control for widespread use by our utility customers throughout the country is something we do only when we're more than just "hopeful" that it will operate in the field the way the designer intended it to. Automatically, this means many hours of realistic testing under the conditions of actual use.

Fisher-Pierce now has an improved photocontrol to offer you and it's shown there in the photo captioned "Model 6620." It was developed for the same reason almost all new things are developed: to improve on what is presently available. From a sales standpoint it *is* new, but about five years of circuit design and component refinement lie behind it. We say it's an improved control because the circuit has fewer components *and dependably gives the same performance* as previous controls. (Cutting down the number of components *by itself* doesn't necessarily make anything "better" — only when it yields operation as reliable as you had in the first place.)

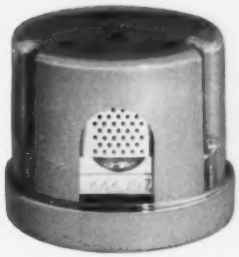
We think this new control is well worth trying.

**NEW & SIMPLIFIED MODEL 6620**



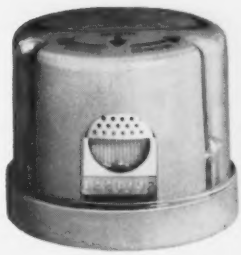
Design approach: simplify the 6600A circuit without sacrificing performance or long life; use of new, fully tested Sigma AC relay permits elimination of certain components; 1000-watt capacity; guaranteed for two years.

**THOROUGHLY FIELD TESTED MODEL 6600A**



Fully proven with billions of service hours in field installations of all types; 1000-watt capacity; Model 6607 available for mounting bases 3⅛" in diameter; Model 6700 available for use on 240-volt lines, fits 3⅜" mounting bases; guaranteed for two years.

**NEW, 500-WATT CAPACITY MODEL 6650**



Designed for farm lighting, other lower-wattage installations; similar to Model 6620 controls except for reduction of contact rating; ideal for use by utilities, REA's and cooperatives in promotion of farm and suburban lighting; guaranteed for two years.

**other Fisher-Pierce controls and related equipment**

TYPE 250A MULTIPLE RELAY for increasing by 3000 watts the load capacity of a single photoelectric control; compact, weatherproof, low cost.

SERIES 63300C CONTROL with 3000 or 6000 watts capacity; turn-on 0.5 to 500 foot-candles; weatherproof head enclosure fits meter socket.

SERIES 6100 CALIBRATOR for simple, rapid checking and adjustment of operating points of all F-P and nearly all other types of photoelectric controls.

*For complete design information and operating specifications on all Fisher-Pierce equipment, write Fisher-Pierce Division, Sigma Instruments, Inc., 43 Pearl Street, So. Braintree 85, Mass.*

FP
FISHER PIERCE

# ANOTHER FIRST FROM HOLAN...

## So New We Haven't Dressed it Yet

*It's ready now* — the first center-mounted derrick for the utility field that can be operated from a rotating crow's-nest. All that's left to be done is to sheathe in a famous Holan-built body.

But it has already been subjected to hour after hour of torturous digging and lifting in every position. And it can take it . . . take even the punishment of harnessing the 8,400 pounds of torque of the Holan 5400 Earth Borer.

The center-mounted 7700 erases the blind spots, permits the operator to dig and "live boom" 9,000 pounds . . . rotate 360° in either direction . . . extend and retract the 7-foot boom . . . set 80-foot poles. And he does it all with foot and hand controls . . . and with a safe, unobstructed view of his work area.

The derrick — including the base, superstructure and hydraulic outriggers -- is built as an integral unit and can be easily mounted on the chassis at any point behind the cab.

Make it a promise to see this powerful and remarkably versatile derrick with its full range of optional equipment before you buy any center-mounted derrick. Call your Holan Field Representative . . . or write us today . . . for complete information.

HOLAN CORPORATION, 4100 W. 150th St., Cleveland 35, Ohio

*For phone number of closest representative see advertising index in back of book.*

# MANUFACTURERS AND DISTRIBUTORS

► Alcoa's **Rome Cable Division** has moved its northern California distribution center to South San Francisco. The new 25,000-sq-ft facility in Utah Construction Co.'s Industrial Park represents a doubling of warehouse capacity, according to Ross Fraser, division president.

► **Westinghouse** is building a multipurpose facility at 1680 S. Redwood Road in Salt Lake City to replace one at 235 W. South Temple St. The building will house the apparatus manufacturing and repair plant, apparatus sales, engineering and service, X-ray marketing and lamp sales. **H. B. Hodgins** is Intermountain District manager and **Fred Murdock** is manager of the Salt Lake City plant, Manufacturing and Repair Division.

► **Allis-Chalmers** has been named principal supplier for the **Oroville-Wyandotte Irrigation District project** north of Sacramento, Calif. The project will control the watershed for irrigation in the south fork of the Feather River and will provide hydro power generation at key dams along the system. Power generated will be tied in with Pacific Gas and Electric Co.'s steam generation lines.

► **Baker Electric Co.** of Denver announced expansion plans after acquiring the inventories and plant repair machinery of **Ward Electric** Co. Tom Baker, president, said a 13,500-sq-ft addition will be constructed at once for small motor production and a repair shop. The firm's large motor repair division handles rewinding and rebuilding of motors up to 3,000 hp. **Ward Electric** announced it had discontinued its service business and has purchased the **Electric Motor Supply** Co.

► In a change of distribution setup, **Curtis-AllBrite Lighting** Inc. has established agents in several Western trading areas instead of having its own field sales staff. Many of these agencies are being set up with former company sales employees. In the San Francisco and Northern coastal region: **M. C. Very,** former division sales manager, San Francisco; **A. D. Montgomery and N. D. Taylor,** formerly with the company, have formed Sales Affiliates, P.O. Box 2711, San Francisco, as agents for the line. In the San Joaquin Valley **Gene Pickerell,** 1716 O St., Sacramento, is the agent. In Seattle **Gerry Miller** and two former associates have set up an agency at 2316 Sixth Ave. In Los Angeles **Charles Schoolbred** likewise is agent with offices at 964 N. Virgil St. Salt Lake City's agent is **Jim Stevens** at 49 N. Second West. In Denver **Joe Travis** and his Travis Lighting Sales at 8410 W. Third Place is the agent, according to J. R. Ray, vice president and general sales manager. Quotations, engineering data, orders and general correspondence are to be directed to these agents.

► **Reynolds Metals** Co. has set up a structural erection service at Phoenix with **Charles F. Week** in charge. The new function will be responsible primarily for on-site erection help to customers. In production for less than two years, Reynolds' structural fabrication plant has been producing aluminum transmission towers, switchyard structures and other heavy structural aluminum units.

► **Rome Cable** Corp. has announced availability of a complete line of **underfloor duct** through its T. J. Cope Division. The system was formerly manufactured by National Supply Co. and was marketed as Spang underfloor duct and headerduct.

► **Federal Pacific Electric** Co. has reorganized its manufacturing operations by integrating 16 plants into three regional manufacturing groups, it was announced recently by President T. M. Cole. The regional groups are Eastern, Central and Western. The Western division will be headed by Leonard P. Shelley, company vice president previously in charge of Federal Pacific's operations in Santa Clara, Calif. Included in the division will be the plants at Santa Clara, Los Angeles, San Francisco and Seattle.

► **Mullenbach Division** of Electric Machinery Mfg. Co. in Los Angeles is now making a full line of Uni-Bus duct patented and introduced by its Eastern affiliate, **Electric Distribution Products.**

► **Earle C. Call & Associates** of San Francisco has been appointed a sales representative for **Trent** Inc. of Philadelphia, manufacturer of electrically heated industrial equipment.

► **Westinghouse Electric Supply** Co. has started construction of a new warehouse and office building in Oakland to replace the one destroyed by fire last October. W. K. Ostler, branch manager, said that the new building will be located at the corner of West Grand Avenue and Willow Street and will be a modern one-story distribution office and warehouse.

► **California Wholesale Electric Co.** of Los Angeles received an "outstanding sales award" at the first annual sales conference conducted in Houston by the Wide-Lite Corp. Clarence Kluttz of California Wholesale received the plaque from L. D. Black, head of L. D. Black & Associates of Los Angeles, manufacturers' representative for Wide-Lite, manufacturer of outdoor area lights and floodlights.

► **Paul G. La Vigne,** general manager of Western operations for the John C. Virden Co., will head up the company's new Interior Systems Division. The new division will manufacture and market complete interior systems products for commercial, industrial and institutional construction. Headquarters will be at the company's factory and Western offices, 300 N. Baldwin Park Blvd., City of Industry, Calif.

► New representative for **Rusgreen Mfg. Co.** in San Francisco is **Garrison & Co.** Address is Builders Exchange Building, 850 Van Ness Ave., San Francisco.

► A new **Gedney** agent is **H & C Electric Sales** Co., 1206 Myrtle Ave., El Paso, Tex. H & C will represent the manufacturer in New Mexico and Texas.

► The **A. B. Chance** Co. has acquired a 49% interest in **Pitman Mfg.** Co. of Grandview, Mo. Pitman makes truck-mounted hydraulic cranes and diggers for the construction and utility industries and hydraulic aerial personnel platforms for electric utilities and fire departments. The two companies will retain separate identities and sales and distribution channels.

► **Graybar Electric** Co. was the first firm to sign a lease for facilities in a new 13-acre industrial tract at Anaheim, Calif. Construction is under way on a 26,741-sq-ft plant.

► **Duro Fittings** Co. of Los Angeles has been acquired by **American-Marietta** Co. and will be operated as a division. American-Marietta got into the electrical construction products field when it acquired **Steel City Electric** in 1959.

# PRODUCT INFORMATION SERVICE

**For fast action in securing the manufacturers' literature listed below simply circle and mail the postpaid card opposite. Use the same card to obtain more information about the new products described on the following pages. This Electrical West service is intended as an aid in keeping product files current**

**ALUMINUM TOWERS**—Additional information on the design and fabrication of aluminum towers is available from Aluminum Co. of America in its bulletin 873-D. *Circle No. 11.*

**HEAVY-DUTY SAFETY SWITCH** — Bull-Dog Electric Products Division of I-T-E will be happy to send additional information to those interested in 1,200-amp switches in NEMA 1 and NEMA 3 enclosures. *Circle No. 12.*

**TAP CHANGER** — Westinghouse Electric Corp. has announced a new high-voltage load tap changer on 200-mva transformers and will be glad to furnish additional information. *Circle No. 13.*

**STEEL CONDUIT**—Alcoa offers more information on Rome rigid steel conduit in its bulletin RCP-940. *Circle No. 14.*

**FOUNDATION ANCHORS**—A. B. Chance Co. invites you to ask for a detailed bulletin that shows how its anchors can help you save time in the installation of pad-mounted transformers. *Circle No. 15.*

**OVERHEAD GROUND WIRE** — If you need information on the application of Alumoweld wire it is available in this company's engineering bulletin ED 3000. *Circle No. 16.*

**BUTYL RUBBER**—To find out how this versatile rubber is used to improve electrical products, send for information offered by Enjay Chemical Co. *Circle No. 17.*

**POWER CONNECTIONS**—For further information on the application of the Cadweld process used to make high power connections, specifications have been made available through this manufacturer. *Circle No. 18.*

**COUPLINGS AND CONNECTORS**—Need additional information on conduit and EMT couplings and connectors? Electrical Tubular Products Inc. offers samples and price lists. *Circle No. 19.*

**OVERHEAD GROUND WIRE** — Indiana Steel & Wire Co. invites you to write for its booklet OG-25 containing sag and tension data for overhead ground wire. *Circle No. 21.*

**CUTOUTS**—James R. Kearney Corp. will be happy to send you the HX cutout bulletin, which contains complete application information. *Circle No. 22.*

**CONDUIT FITTINGS**—The L. E. Mason Co. of Boston, Mass., offers a complete up-to-date illustrated catalog on its Red Dot line of aluminum fittings. *Circle No. 23.*

**STREET LIGHTING** — Pfaff & Kendall has a new brochure ALS-5 containing a wealth of helpful information on street lighting plans. *Circle No. 24.*

**STEEL CONDUIT**—Republic Steel Corp. would like to hear from you if you want to learn more about the advantages of its rigid steel conduit. *Circle No. 25.*

**SERVICE EQUIPMENT** — The Square D Co. has a new bulletin No. SL-27, featuring E-Z STACK design multimetering devices, a complete cataloging of features, specifications, suggested arrangements and bills of material. *Circle No. 26.*

**PAINT**—Thinking of painting? Subox Inc. will be glad to send you a color card and literature. *Circle No. 27.*

**POLES**—The Weld-Rite Co. of Oakland, Calif., has a new fully illustrated 24-page catalogue it would like to send you. *Circle No. 28.*

**LOW-VOLTAGE DISTRIBUTION**—In its Buy Log series, General Electric has issued a 92-page catalog covering low-voltage distribution equipment. Designed as a condensed buying catalog for products of its Distribution Assemblies and Circuit Protective Devices Departments, the publication features product selector charts, descriptions, consolidated pricing tables and a catalog number index. *Circle No. 29.*

**GUIDE**—Westinghouse is offering a selection guide for glass polyesters, water-resistant glass-mat laminates and molding compounds for class B insulation applications. *Circle No. 31.*

**INFRARED**—A folder on its Quartz-Rave infrared fixtures has been prepared by Pinco Inc. These fixtures are available in two voltage ratings: 120 for plugging into a convenience outlet and 240 to be wired for direct connection. *Circle No. 32.*

**LIGHTING STANDARDS**—Pfaff & Kendall is offering a new 12-page catalog of davit-style lighting standards. The units are classified by mounting height and arm extension. *Circle No. 33.*

**HIGH-BAY LIGHTING**—Bulletin H from the Benjamin Division of Thomas Industries suggests installations for the manufacturer's mercury vapor and incandescent lighting fixtures. In the first few pages are defined some of the basic factors involved in solving industrial lighting problems. *Circle No. 34.*

**WIRE**—Specification requirements and allowable current-carrying capacities for Densheath 900 are covered in a new brochure from Anaconda Wire & Cable Co. Included are quick reference data usable in most applications of this high-temperature (90 C) industrial wire. For DM-6030 *circle No. 35.*

**HEATING** — For the architect, engineer, contractor and owner catalog 975-D gives application and product data on Chromalox electric comfort heating equipment. Solutions for problems in residential, commercial and industrial heating are given. *Circle No. 36.*

**CRIMP CONNECTORS**—Ideal Industries is offering a data sheet on its new larger size crimp connector to handle larger wires and combinations used in branch circuit wiring, machine hook-up, etc. *Circle No. 37.*

**LUMINAIRES**—Type SF surface-mounted fluorescent luminaires are described in a six-page booklet prepared by Westinghouse. For a copy of SA 8868 *circle No. 38.*

**BANK LIGHTING** — Containing installation photos in nine banks, a four-page folder from Holophane shows traditional and modern settings with some half-dozen styles of lights in use under various conditions of space, layout and architectural design. *Circle No. 39.*

**FLOODLIGHTS AND ACCESSORIES** — Spero Electric Corp. has issued a new catalog of its floodlights, brackets and aluminum and steel poles. Selection, specification and installation data for the equipment are given. *Circle 41.*

**F BALLASTS**—A new catalog from Universal Mfg. Corp. lists lamp type and catalog number of the manufacturer's line of ballasts for indoor and outdoor applications. It contains wiring diagrams and lead lengths with thumb index. *Circle No. 42.*

**TEST INSTRUMENTS** — Instruments for testing cables, transformers and generators are listed in a catalog published by Associated Research for utilities and industry in maintenance, installation and proof-testing of electrical equipment. *Circle No. 43.*

**ELECTRIC OVENS**—New features of its twin-flow industrial oven are listed by Ramco Equipment Corp. in bulletin 960. *Circle No. 44.*

**PUSH BUTTON STATION** — Joy's new Flexitite all-rubber push button station for oil-tight and heavy-duty service is described in a new bulletin from the manufacturer's Electrical Products Division. *Circle No. 45.*

**INSULATION**—A revised catalog available from Johns-Manville gives thermal insulations for all types of commercial and industrial requirements in applications ranging from —400 F to 3,000 F. For 64-page catalog IN-244A, *circle No. 46.*

**COMMERCIAL LIGHTING** — Benjamin Division, Thomas Industries, describes its complete line of suspended commercial fluorescent lighting units in bulletin C. *Circle No. 47.*

**MOTORS**—Super-Seal motors for severe operating conditions in industry are described in Allis-Chalmers bulletin 05-51B9040B. *Circle No. 48.*

**HEATERS**—Bulletin CH-100 from Fostoria Corp. describes a new line of electric infrared comfort heaters designed for hard-to-heat indoor and outdoor areas. For a copy *circle No. 49*

**VINYL COATING**—RT&E Corp.'s Concentration, winter issue, gives information on Armortec, a new vinyl exterior coating that replaces paint on the manufacturer's pole-type distribution transformers. To secure a copy of this publication *circle No. 51.*

SIMPLE...
SAFE...
LIQUID-TIGHT...

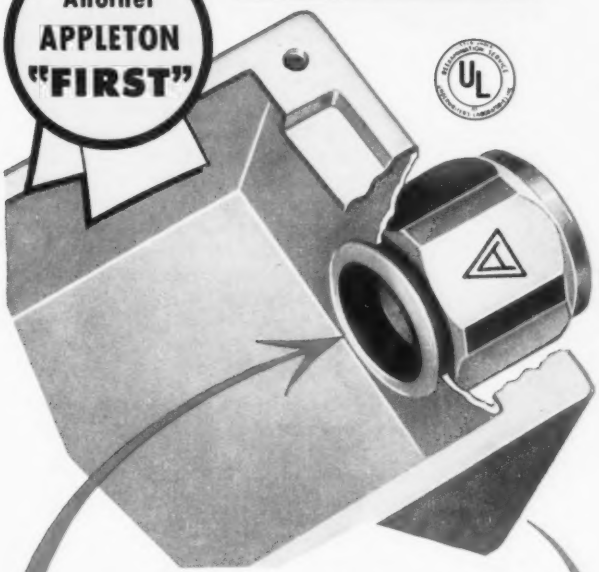
# APPLETON®

# UNI-SEAL
## Rigid-Conduit HUB

Patent Pending

Another APPLETON "FIRST"

DUST-PROOF!

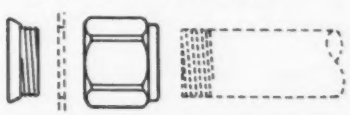


Unparalleled ease of installation and positive liquid-tight, dust-proof protection are built right into this new APPLETON *Uni-Seal Hub.* An exclusive wedge adapter pulls up tight in the knock-out hole to give a lasting metal-to-metal "cold-weld" seal with full assurance of a perfect ground. Lasting resistance to vibration! Maximum wiring room because wedge adapter tightens down almost flush inside box! Insulated throat to protect wiring! Single wrench installation! So . . . for cost-cutting wiring installation, specify APPLETON UNI-SEAL Rigid Conduit Hub!

### Eliminates Welding!

**Up to now when a tight box-hub seal was wanted, threaded hubs were attached by the costly, complicated, time-consuming method of welding. This gave a rough, frequently off-center result. Today, with APPLETON Uni-Seal Hubs, you get a liquid-tight connection without welding . . . simply, easily and always uniformly centered. Application requires only a single wrench! Always a perfect "cold-weld" seal! And the wedge adapter is almost flush with inside box wall for maximum wiring room.**

### HOW IT WORKS...



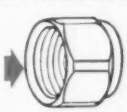
Wedge adapter with threaded shank is inserted through junction box hole. Threaded hub with special locking edge on body is screwed down on adapter threads until box metal is firmly gripped between adapter wedge and locking edge. A pull or two on the hub with a single wrench locks the hub in position permanently with a perfect metal-to-metal "cold-weld" seal that does not vibrate loose. Rigid conduit is then screwed into hub.

**Also available in a Union type.**
Pat. Pending

### These 4 Exclusive Benefits are YOURS... with APPLETON

**New Insulated Throat!**

An insulator insert provides complete protection against damage to wires from metal edges. No reduction in inside throat diameter. The complete answer where vibration is a problem!

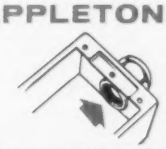


**New Locking Edge on Body!**

Puts continuous pressure on wedge adapter! Bites into outer box wall to eliminate loosening through vibration! No lock nut needed! Assures positive ground!

**New Wedge Adapter!**

Note adapter surface angle . . . how design permits it to tighten almost flush with inner box wall. Maintains positive ground and a constant, liquid-tight, "cold-weld" seal when pulled down.



**Increased Wiring Room!**

Interior view of wiring box with installed UNI-SEAL Rigid Conduit Hub showing how wedge adapter tightens almost flush to provide maximum wiring room. No weld! No wrench required inside box!

*Sold Through Franchised Distributors Only*

**APPLETON ELECTRIC COMPANY**
1701 Wellington Avenue • Chicago 13, Illinois

*Also Manufacturers of:*

Industrial Lighting Equipment

Malleable Iron Unilets

"Eagle Claw" Switch Boxes

Automatic Reelites

APPLETON ELECTRIC PRODUCTS®

*For phone number of closest representative see advertising index in back of book.*

# PRODUCT NEWS

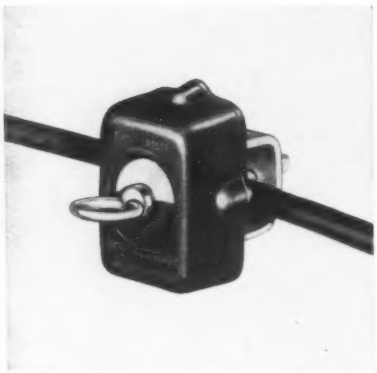
## New designs and applications

### Pad-Mounted Gear

*S&C Electric Co.*

New pad-mounted gear has been introduced by S&C for switching, protecting and isolating residential underground distribution circuits from 2.4 to 14.4 kv. The new gear, rated up to 400 amp at 14.4 kv when used with the Loadbuster, consists of fuses and disconnects expressly designed for compact, air-filled enclosures. According to the manufacturer, the fuses can be changed without opening the tanks, and fuse operations do not affect the transformer oil.

**Circle No. 52**



### Underground Fault Indicator

*Line Material Industries*

New fault indicators developed by Line Material Industries are designed for use on underground distribution systems. These indicators are current-operated devices with a tentative minimum trip range between 300 and 450 amp. The fault indicator can be mounted on all cables from 5/16 in. to 1 13/16 in. over-all diameter regardless of system voltage, and should be installed at the time the cable is installed. The fast, one-half cycle time current characteristic enables coordination of the indicator with all overcurrent protective devices such as reclosers, breakers or cutouts.

**Circle No. 53**

### Baseboard Heater

*Cavalier Corp.*

Cavalier Corp. of Chattanooga, Tenn., has introduced its new CL-A automatic electric baseboard heater which comes in 4-, 6-, 8-, and 10-ft lengths for fast installation. The unit simply attaches to walls with two screws or two nails through prepunched holes. Each length is prewired and completely self-contained.

**Circle No. 54**

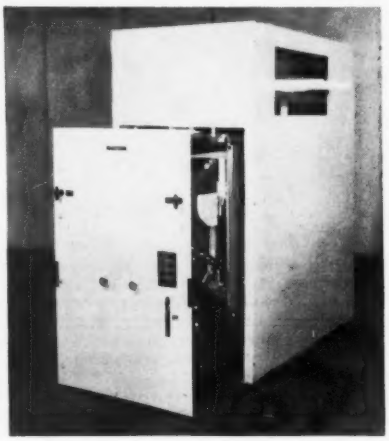
### Single Tank Oil Circuit Breaker

*Federal Pacific Electric Co.*

A single tank oil circuit breaker, with ratings of five-cycle, 100, 250, and 500 mva for 14.4 kv and below, has been introduced by Federal Pacific Electric Co. to help utilities and large industrial plants meet the rapidly increasing demand for moderate voltage distribution equipment.

Taking up less space and requiring less maintenance and installation than any similarly rated units manufactured previously, this AD-28 outdoor power circuit breaker is designed to open and/or close on three-phase electric current in the 4-kv to 14-kv range for the purpose of protecting systems from damage that may arise under any circuit condition.

**Circle No. 55**



### Drawout Fused Switch

*Westinghouse Electric Corp.*

Developed to protect 2,400- to 13,800-v distribution circuits at moderate cost, this new drawout, fused, metal-enclosed switchgear has been made available for commercial, institutional, light industrial and other applications which require compact, reliable protective equipment but do not require the use of circuit breakers. Identified as load-interrupter switchgear, it is built around a drawout design in which the switch-and-fuse element is withdrawn from the enclosure whenever fuses are to be replaced or switch contacts inspected.

**Circle No. 56**

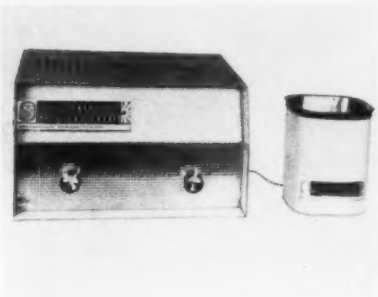
### Fault Locator

*Ferranti Ltd.*

A new radar-type fault locator for transmission lines has been developed by Ferranti Ltd., a British electronics firm. The instrument uses the radar principle of pulse reflection. It is an a-c-type locator for use on live lines, and has had extensive field trials on an electric supply project in Scotland.

Reflected impulses caused by any discontinuity are received by the locator and displayed on a cathode-ray tube for either visual or automatic photographic record. The distance to the fault may be found by measuring the time interval between the sending of the pulse and the reception of its reflection.

**Circle No. 57**



### Ultrasonic Cleaner

*Ultrasonic Industries*

This company announces a small economy ultrasonic cleaner with a one-pint capacity. The unit consists of a 30-w generator—120-w peak output, a tank 3⅝x3⅝x3 in. deep and a cover. The system will clean small manufactured parts such as electrical contacts, precision gears, etc.

**Circle No. 58**

### Lightning Arrester

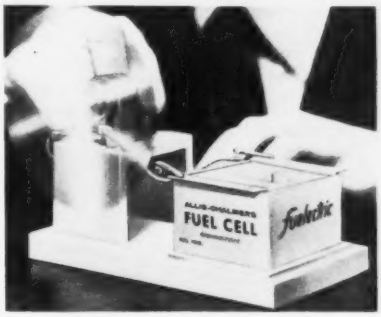
*James R. Kearney Corp.*

This company announces its new line of Unigap arresters featuring a new type unitized gap construction in which the functions of both a spark gap and separate coil have been combined in a single, rigid, precision assembly. The company says this new design will insure that the arrester's original characteristics will remain unaltered during shipment and during and after installation.

**Circle No. 59**

## READER SERVICE CARD

**For your added convenience in obtaining more information on the new products shown on these pages or offered by our advertisers elsewhere in the issue, a postage-paid reader service card has been included between pages 100 and 101. Just circle the numbers corresponding to the items described and tear out and mail the card.**




### Model Fuel Cell

*Allis-Chalmers Mfg. Co.*

Allis-Chalmers Mfg. Co. has made available a working model fuel cell demonstrator for instructional and educational purposes. The table-top demonstrator kit turns chemical energy directly into electrical energy. This kit contains two major components, the fuel cell and a small electric motor, plus leads. The entire assembly measures 7 in. long, 3½ in. wide and 5½ in. high, including a propeller for attachment to the motor shaft.

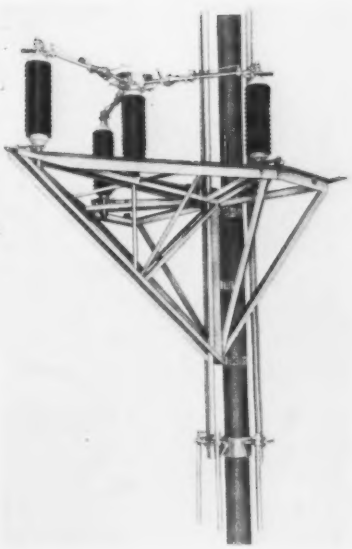
**Circle No. 61**

### Aluminum Unions

*Killark Electric Mfg. Co.*

A line of all-aluminum, explosion-proof unions with small exterior dimensions has been introduced by this company. Two models are available, one with female ends, and one with a male end and a female end. The body and ring of these unions are tapered to provide a positive seal if an interior explosion occurs. UL and CSA approvals have been obtained.

**Circle No. 62**



### Air Switch

*Southern States Equipment Corp.*

Southern States Equipment Corp. of Hampton, Ga., has made available a phase-over-phase, pole-mounted air switch. It is available in one-way, two-way, or three-way models designated types 57L-1, 57L-2 and 57L-3, respectively. All three models are available in voltage ratings from 7.2 kv to 69 kv and continuous current ratings of 600 to 1,200 amp.

**Circle No. 63**

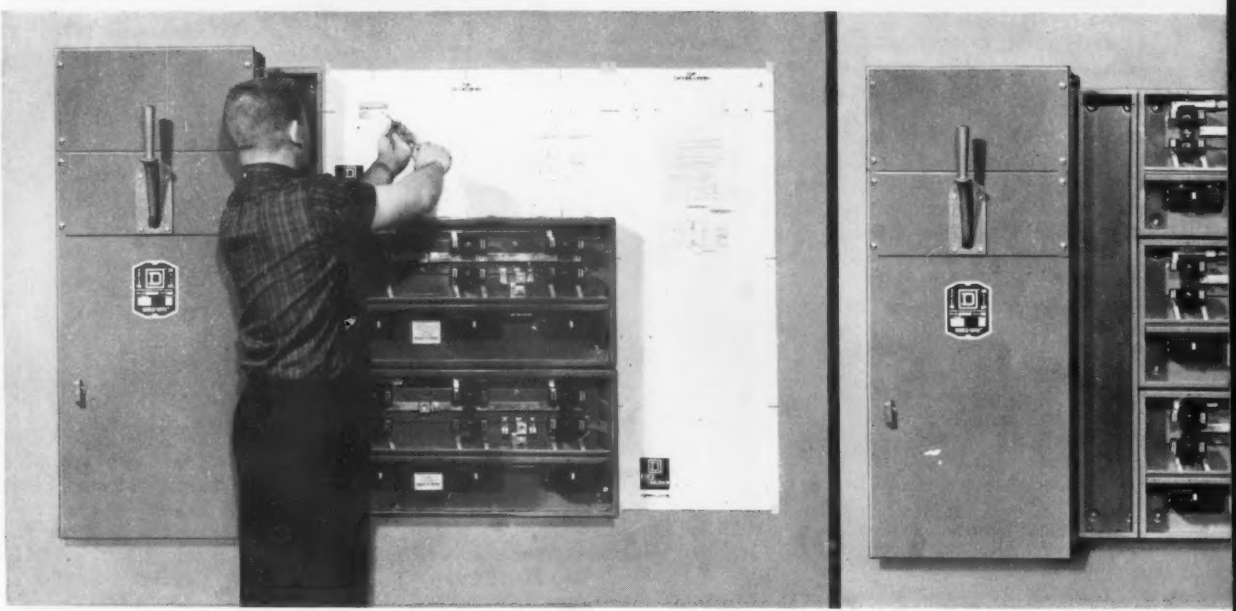
### Cable Sheath

*Hendrix Wire & Cable Corp.*

The Hendrix Wire & Cable Corp. announces a new Clip-On-Line-Duc, which successfully prevents insulation and sheath abrasion by trees or other foreign objects and provides insulation values up to 15 kv. It can be quickly and easily clipped on open distribution conductors, cabled service drops or communication cables.

**Circle No. 64**

# *new* D® E-Z STACK



## *easy as hanging a picture...*

and in stock at authorized distributors

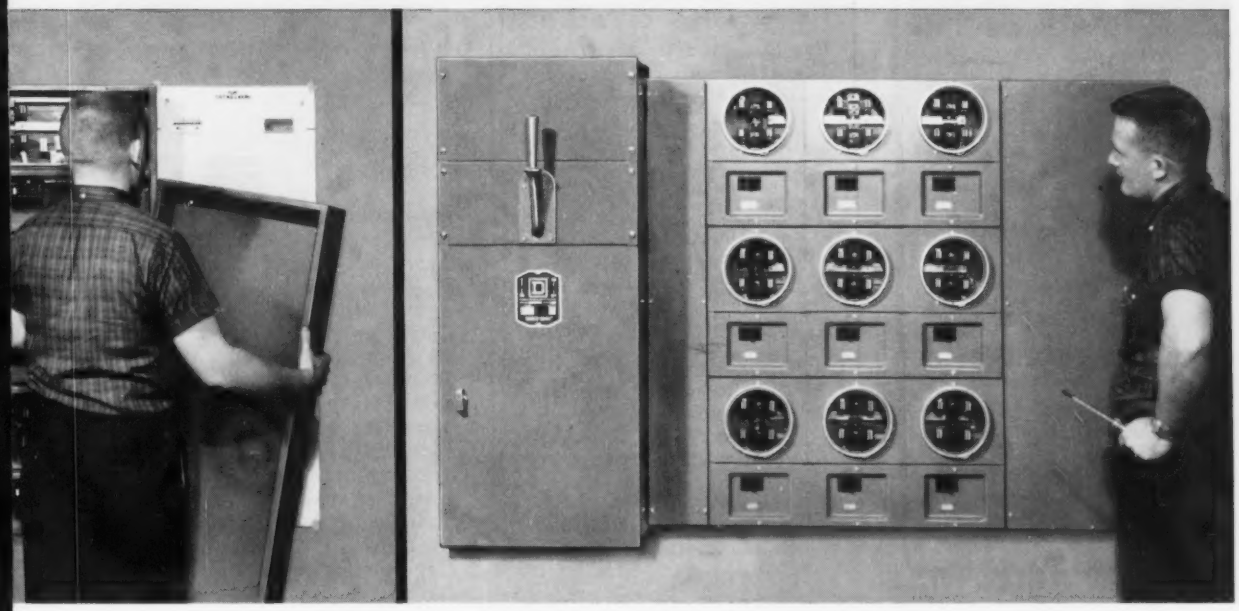
**PLAN YOUR OWN ARRANGEMENT** — Available wall space for the service and grouping of meters is frequently limited — and of a particular size and shape. Required locations of service and load conduits vary with each job. With E-Z STACK you have freedom of arrangement.

**TEMPLATE LAYOUT** — For installation convenience E-Z STACK devices include a full size template and wall mounting hanger brackets. Templates, attached to the wall, accurately position the hanger brackets for each device. Brackets on the wall interlock with clips on the back of the device.

**AVAILABILITY** — All E-Z STACK devices can be ordered by catalog number from authorized Square D Distributors *as they are needed.* Individually cartoned, the final decision as to the meter arrangement and size of the circuit breaker disconnect for

SQUARE D COMPANY

# *multi-metering devices*



each apartment can be determined at the Distributor's counter.

**MAN-POWER** — Unit assembly of the final configuration permits easier handling of all components. The wall brackets support each unit — in its proper place — while permanently securing and inter-connecting the entire installation.

**WE CALL IT E-Z STACK BECAUSE** — the basic meter-breaker devices easily stack one on top of the other. All devices are "meant for each other" — and bracket suspended. Knockouts in adjacent devices line up; bushings protect inter-connecting wiring. Load lug assemblies in disconnects and service entrance terminal boxes are pad-mounted in the right quantity for every E-Z STACK installation. All devices are designed for a specific purpose—multiple-metering installations.

*Underwriters' Laboratories Approved*

**GET ALL THE FACTS!** Send for new Service Equipment Bulletin No. SL-27 featuring E-Z STACK design multi-metering devices, a complete cataloging of features, specifications, suggested arrangements, and bills of material.

SQUARE D COMPANY c/o ADVERTISING DEPARTMENT B
P.O. BOX 2115, TERMINAL ANNEX • LOS ANGELES 54, CALIFORNIA

NAME _____

COMPANY _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

*wherever electricity is distributed and controlled*

*ASK YOUR ELECTRICAL DISTRIBUTOR FOR SQUARE D PRODUCTS*

*For phone number of closest representative see advertising index in back of book.*

**THEY STAY ON.....**
All VICTOR "MAGIC" CLAMPS and STRAPS for Thin and Heavy Wall Conduits have this time-saving snap-on feature.

Contractors everywhere are switching to VICTOR. Cash in on this heavy demand. Add these fast selling, profitable Clamps and Straps to your line.

Write for the new Victor Strap Catalog. Lists over 600 items to fasten Wire, Cable, Tubing and Conduit.

**VICTOR SPECIALTIES, INC.**
775 MAIN ST., NEW ROCHELLE, N.Y.

*The Greatest Single Source for Clamps and Straps*

*California Representatives:*

**STANLEY SALES CORP.**
1122 Folsom Street
San Francisco 3, Calif.
Phone: UNderhill 3-8900

**HAYJAX COMPANY**
436 Colyton Street
Los Angeles 13, Calif.
Phone: MA 8-5256



TESTS PROVE:
**10% more slip**
with
**Y-ER EAS**
*Wire Pulling Lubricant*
For Lead, Rubber, Braid or Synthetic Covered Cables

**There is only one Y-ER EAS**

***Don't accept substitutes. The extra slip means extra savings on every job.***

- Creamy, non-corrosive. Never greasy or messy.
- Prevents sticking or setting. Extra slip for saddles and turns.
- Does not run back on cables.
- Never harmful to hands, clothing, cables or conduit.

**NEW! ALUM-N-EAS**
Thread lubricant stops binding of aluminum conduit connections!

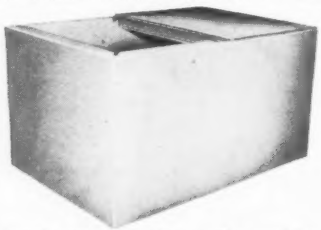
Write for descriptive literature

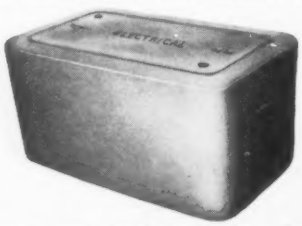
**At all Leading Electrical Supply Houses**

**ELECTRO COMPOUND CO.**
4148 W. 150th St., Cleveland 35, Ohio



PRECAST VAULTS AND HANDHOLES • ELECTRICAL PULL, JUNCTION AND SERVICE BOXES






Reinforced concrete vaults manufactured for large underground electrical projects. • Concrete electrical boxes made to State specifications. Locking lids, ballast notches and side knockouts to accomodate a large range of installations. All popular sizes along with extensions and bases.

*Forni Division,* **CHRISTY CONCRETE PRODUCTS, Inc.**
6150 Hollis Street Emeryville 8, California OLympic 8-7070



***ELECTRICAL CONTRACTORS:***

**You waste a lot of time and money bidding on many jobs you do not get. This costly waste cuts deeply into your profits and you do not make the money you should. We can furnish you excellent electrical estimating service at a saving of over 50% of your present estimating costs. We can furnish you take-offs and man hours only, or we can furnish complete estimates showing detail lists of materials, at current unit prices, and man-hours and labor costs, together with a detailed list of overhead items and profit. You can check each item of our estimate and compare it with your own. Thus you get the benefit of two independent estimators in the preparation of your bids, all at a definite saving in estimating cost.**

***Call us for complete information; without obligation, of course.***

**LeROY CONSTRUCTION SERVICES**
**768 Brannan Street UN 1-2483 San Francisco 3**

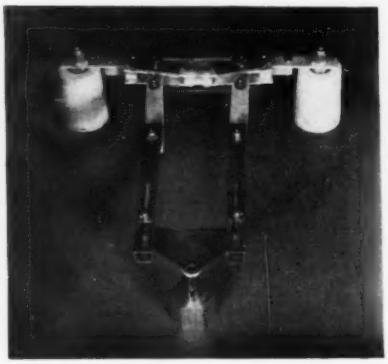
## Hydraulic Digger

*Truck Equipment Co.*

Truck Equipment Co. of Denver, Colo., has announced a new four-speed, heavy-duty hydraulic digger attachment which will deliver 25% more horsepower at the auger than heretofore possible.

According to this manufacturer, by using the high speed or spin-off gear, the operator may dig holes under most normal conditions in one-third to one-half the normal digging time of previous hydraulic diggers.

**Circle No. 65**

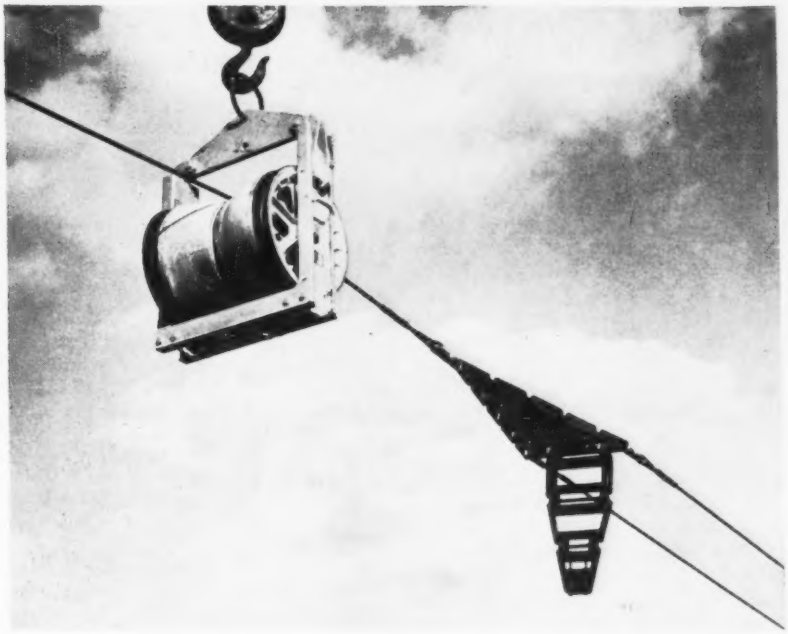


## Load-Break Switch

*General Electric Co.*

A new three-position internal load-break switch for use with single-phase pad-mounted transformers has been developed by the company's distribution transformer department. The new three-position switch mechanism is designed for typical underground looping feed system. Service can be provided from either of two cable sources, permitting complete switching flexibility in isolating feeder sections or transformers.

**Circle No. 66**



### Bundle Conductor Block

*Sherman & Reilly Inc.*

Sherman & Reilly Inc. has been developing new equipment to meet the problems encountered in pulling multiple conductors with a single pulling line. This problem seemed rather simple on the surface but, in practice, many problems evolved. The goal was a stringing block and pulling or running board that would work together smoothly and as easily as stringing a single conductor. After many hours of designing and experimenting, this manufacturer has developed an articulated running board and bundle block which work as a team to produce the desired results.

**Circle No. 67**

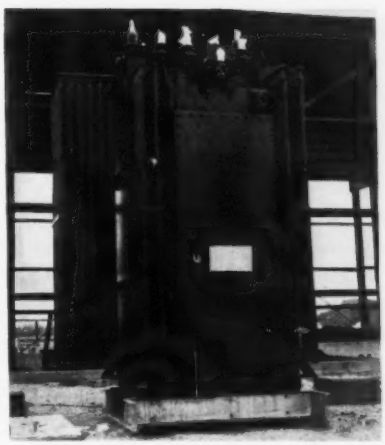
### Aluminum Solder

*Metals for Industry Inc.*

A low temperature fluxless solder, Tin-A-Lum, which melts at low temperatures, has been developed for use on aluminum, aluminum alloys, zinc, tin, pewter, magnesium and other metals.

According to the manufacturer, Tin-A-Lum was perfected as a method of joining any dissimilar metals together and for use on all kinds of materials with the aid of a soldering iron or a light flame and without any flux whatsoever.

**Circle No. 68**



### Transformer Mount

*A. B. Chance Co.*

A large three-phase transformer, weighing 29,900 lb, can be mounted on a base supported by eight steel screw anchors in lieu of the heavy reinforced concrete base normally constructed for such installation, according to the A. B. Chance Co. A 2,500-kva transformer was installed adjacent to the short circuit laboratory at the Chance engineering center in Centralia, Mo.

Eight anchors with 15-in.-diameter helixes were installed with a power digging unit to a depth of 7 ft. The anchor shafts were 2-in. extra strong galvanized pipe.

**Circle No. 69**


# LEVITON QUALITY TALKS

In this column, Leviton will be talking to you about a product or situation that vitally concerns your business. Watch these columns, they might help you solve a problem.

## DON'T MISS LEVITON AT THE NORTHERN CALIFORNIA ELECTRICAL INDUSTRY SHOW

**APRIL 6-9, 1961**
**BROOKS HALL, SAN FRANCISCO**

You'll meet

**Jerry Driscoll**
**Joel Allen**
**Jack Kurtz**

and our Sales Engineer

**Ed Martin**

from the home office to help answer your technical questions.

They'll all be at Booths 323 and 324 to greet you and tell you all about Leviton's new products.

**Bob Kallman**
Regional Manager

*LEVITON QUALITY TALKS BUSINESS*

**LEVITON®**

**LEVITON MANUFACTURING CO., INC.,**
**BROOKLYN 22, N.Y.**
**Chicago — Los Angeles — Montreal, Canada**

Contact American Insulated Wire Corp., Pawtucket, Rhode Island, a Leviton subsidiary, for a complete line of insulated wire and cable products.

NOW AVAILABLE
IN 4-WAY
FOR EXTRA PROFITS

EAGLE

15 AMPS
120-277 VOLTS AC ONLY

IN BOTH FLUSH AND INTERCHANGE TYPES

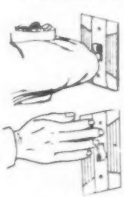
Touch-a-Matic
Quiet
Switch

AN E-Z WIRE ® DEVICE

MEETS FED. SPECS.
PAT. NO. 2,743,330
NO. 244B-Brown
NO. 244V-Ivory

the switch with
ALL the Advantages

• Sure-tight, enclosed, E-Z WIRE ®. Pressure Terminals in rear.
• Just strip and push Wires into Terminals. To release, press down in slot with screwdriver.
• Prevents haphazard connections



• Takes standard wall plates
• Installs in any position
• Feathertouch instant Action

ROCK IT—PUSH IT—TOUCH IT

Packaged in Cellophane-Wrapped
EAGLE
"SHO-PAK" ®

• TOUCH-A-MATICS are also available in S.P. and 3-Way; Flush and Interchange types; 15 Amps and 20 Amps, 120-277 Volts AC only. With plaster ears, self-tapping captive screws.

*Sold Thru Wholesalers Only*

IN STOCK AT PORTLAND, SAN FRANCISCO, LOS ANGELES WAREHOUSES

"Perfection is not an Accident"
EAGLE ELECTRIC
MFG. CO., INC.
LONG ISLAND CITY 1, NEW YORK

# Proposed Western Projects

## Pacific Southwest

Alhambra, Calif., California Lutheran Homes, 106,000-sq-ft home for retired, $2,500,000. Plans by Orr, Strange, Inslee & Seneteld, Los Angeles.

Clovis, Clovis Hospital Inc., hospital and medical building, $1,000,000. Lowe & Lowe, Sherman Oaks, consulting engineers.

El Segundo, Allen H. Rabin, seven-story aerospace center office, roof top heliport and auxiliary ground heliport, $2,500,000. In care of D. L. Dworsky, architect, Beverly Hills; T. H. Jaehn, Los Angeles, structural engineer.

Los Angeles, Board of Education, trade technical college addition, $2,500,000. Plans by Kistner, Wright & Wright.

Los Angeles, L. A. Department of Water & Power, 17-story general office, $30 million. Plans by Albert C. Martin; Ladd & Kelsey, Pasadena, consulting architects.

Los Angeles, Metropolitan Water District of Southern California, three-story office, $2,500,000. Plans by William L. Pereira.

Pomona, Buffums Department Store, department store, $2,000,000. Plans by Welton Becket & Associate, Los Angeles.

Santa Barbara, Santa Barbara News Press, newspaper plant addition, $1,000,000. Plans by Kenneth H. Hess, Ventura.

## Hawaii

Kailua, Hawaii, Centex-Trousdale Development Co., 91 homes, $1,365,000.

Kailua, Windward Oahu Community Assn. and Seventh Day Adventist Church, hospital, $1,500,000.

## Pacific Northwest

Burnaby, B. C., Fraser Valley Milk Product Assn., plant, $3,500,000. Phillips, Barratt & Partners, Vancouver, consulting engineers.

Crofton, British Columbia Products Ltd., newsprint mill, $25 million. H. A. Simons Ltd., Vancouver, consulting engineers.

Victoria, Royal Jubilee Hospital, six-story hospital wing, $2,800,000. Plans by Townley & Matheson, Vancouver; Read, Jones & Christofferson, Vancouver, consulting engineers.

Berkeley, Calif., Regents of University of California, seven-story biochemical laboratory, $2,000,000. Plans by Wurster, Bernardi & Emmons, and W. B. Gilbert & Associates, consulting engineers, San Francisco.

Berkeley, Regents of University of California, college of environmental design, $4,500,000. Plans by DeMars, Esherick & Olsen, San Francisco.

Napa, Napa County, courthouse, $3,000,000. Plans by Van Bourg, Nakamura & Associates, Berkeley, Calif.

Roseville, City, City hospital additions, $1,000,000. Plans by Rex Allen, and Haluk Akol, consulting engineer.

Selma, Sun Maid Raisin Growers of California, raisin processing plant, $3,000,000. Plans by Walter Wagner & Partners, Fresno.

Portland, Ore., Providence Hospital, hospital additions, $5,500,000. Plans by Skidmore, Owings & Merrill.

Auburn, Wash., General Services Administration, Washington, D. C., conversion of buildings for stores depot and records center, $3,000,000. Plans by Harmon, Pray & Detrich, Seattle.

Bellevue, Sterling Theaters Co., theater, $1,000,000. Plans by J. Rushmore & Associates.

Seattle, General Electric Co., appliance distribution center, $1,000,000. Plans for the center by Bindon & Wright.

Seattle, Consolidated Dairy Products Corp., milk plant addition, $1,000,000. Plans by Johnson & Johnson, Los Angeles.

## Rocky Mountain

Arvada, Colo., Hoy Construction Co., shopping center, $1,000,000.

Aurora, School District 28J, schools, $3,033,000.

Colorado Springs, City, City library, approximately, $1,000,000.

Denver, City and County of Denver, control tower, $522,000. Plans by Paul Reddy.

Denver, Hampshire Investment Co., 15-story apartment, two-level parking, swimming pool, $1,100,000. Plans by Donald H. Roark; Lindquist & Griffith, mechanical engineers; Johnson & Voiland, structural engineers; Sol Flax, electrical engineer.

Fort Collins, State Planning Division, Colorado State University library addition, $1,000,000. Plans by James M. Hunter, Boulder.

Pueblo, City, airport control tower, $185,000. Plans by Kenneth Stines.

Clovis, N. M., Methodist Church, home for aged, $2,250,000.

# Trading Post

**Space in the Trading Post is available at $4 per line per issue with a minimum of three lines – more than seven lines – $18 per inch. Write to Trading Post, Electrical West, 255 California St., San Francisco 11, Calif.**

Eastern manufacturer of quality baseboard and panel heaters wants qualified representatives in Seattle, Portland, San Francisco and Los Angeles. Must have good distributor contacts. Refer to Dept. MR101.

Manufacturer of electrical radiant heating system wants northern California representatives. Refer to Dept. MR102.

Retired sales executive available for part-time marketing consulting in California. Refer to Dept. MR105.

Southern California manufacturer of transmission line construction specialties wants representatives in the Northwest and Rocky Mountain areas. Refer to Dept. MR106.

Long-established manufacturers' representative organization with offices in northern and southern California is looking for recognized lines to round out distribution equipment package for electric utility customers. Warehouse facilities available. Refer to Dept. MR109.

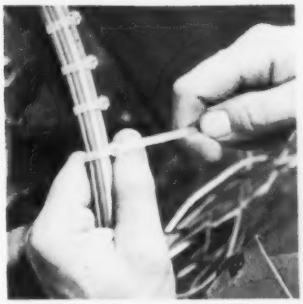
Major style leader bringing out new line needs representation in states of Arizona, Nevada, Colorado, Utah, New Mexico, Idaho, Montana, Wyoming as well as cities of Los Angeles and San Diego, Calif. Man must have following and experience with electrical distributors. Please state qualifications, experience and references. Refer to Dept. MR110.

Electrical agent, San Francisco, has 3,750 sq ft of spare warehouse space for rent. Can share expenses. Refer to Dept. MR 113.

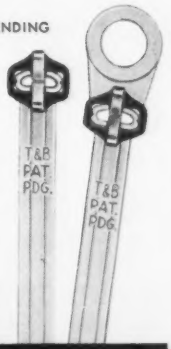
**SALES AGENTS WANTED**

Sylvania Lighting Products-Fixtures is seeking established sales agencies to represent them in Northern and Southern California. Only applicants with proven sales record and a strong background in lighting fixture specification will be considered. Contact Dept. MPD, Sylvania Electric Products, 48th Street, Wheeling, West Va.


ELIMINATE TAPE, STRING, CLAMPS
with self-clinching
NEW
TY-RAP™
cable ties
and straps



PAT. PENDING




Neat, permanently secure cable ties and mounted bundles in seconds — with no strain on hands or conductors. Self-clinching lock won't loosen until intentionally removed. See your T&B Distributor or write to Thomas & Betts Co., Incorporated, Elizabeth 1, N. J. (In Canada: Thomas & Betts Ltd., Montreal; in England: Ross, Courtney and Company, Limited.)

T&B ENGINEERED THOMAS & BETTS

Puzzled
about TIME SWITCHES?

ANSWER:
specify PARAGON!

See your authorized PARAGON distributor. He carries a complete stock of PARAGON Time Controls, and is able to offer you technical assistance on any application problem. Call now and find out!

TIME IS MONEY...CONTROL IT WITH PARAGON

PARAGON ELECTRIC COMPANY
1616 Twelfth Street, Two Rivers, Wisconsin

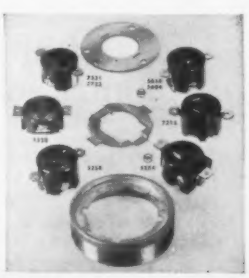
Short Stem
TELEPHONE
and
DUPLEX
NOZZLES

**Shorter styled, modern, flanged duplex telephone and receptacle nozzles in satin brushed brass or anodized aluminum. Standards fit ½" opening. ¾" stems available Also grounded receptacles.**

*Adjustable*
STEEL BOX

This is our #190 series, with a 3¼" brass cover plate. Comes in two standard heights—3⅛" and 2⅝" minimum. Designed for power or telephone service. A "KEY" (shown in center of photo below) which fits most popular size and style receptacles has been added at no extra cost.

Adjusting ring for our 190 series is so designed that KEY drops easily into special slots. You select the receptacle required and simply "LAY-IN"; then "LAY-ON" receptacle ring. That's it.



FULLMAN MANUFACTURING CO.
LATROBE . . . PENNSYLVANIA

# BELL

*The* ***BEST*** *in*

## WEATHERPROOF

**MOST COMPLETE LINE**
of Weatherproof
COVERS and BOXES

**SAFE-T-LOK**
WEATHERPROOF
**SNAP COVERS & RECEPTACLES**

Snap Open . . . Stay Open . . . Snap Shut! 1 to 10-Gang Combination Switch & Receptacle Device.

***SOLID BRASS***

***New!*** **Construction Features**

*NEW EXTRA-SAFETY*
**TAMPER-PROOF SNAP-COVER**
Equipped with Padlock Hasp — Stops Current Pilferage, Tampering, Accidental Shock. 1, 2, 3-Gang Duplex Receptacle, or combination switch and receptacle.

***New!*** **Easy Installation**

**CAST ALUMINUM BOXES**

1-Gang and 2-Gang 3 to 7 hubs, ½" or ¾" with aluminum plugs.

***New!*** **UNIVERSAL BOX**
fits practically any cover — holds device firmly.

***New!*** **Quality Performance**

**NEW PORTABLE**
*WEATHERPROOF*
**LAMPHOLDER OUTLET BOX**
Lampholder, outlet and switch in aluminum housing. Complete with spike and cord. Spikes in ground for electricity and lighting where needed.

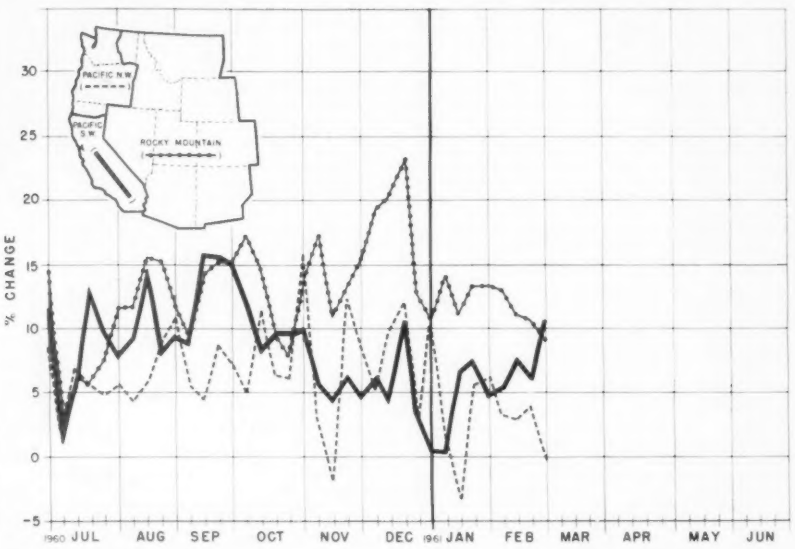
***Write For Complete Weatherproof Catalog***

BELL
ELECTRIC CO.
5735 S. Claremont Ave.
Chicago 36, Ill.


# WESTERN BUSINESS TRENDS &

## Output Comparisons

**Year-to-Year Kwh Output Changes. Per Cent Change Over Same Week One Year Ago for Region as Indicated in Keyed Map**




### Electrician's Wage Scale

Shown are union hourly wage scales for electricians in selected cities in the 11 Western states. These scales represent the minimum wage rates (excluding holiday and vacation payments, regularly made or credited to the worker each pay period) agreed upon through collective bargaining, effective Jan. 3, 1961

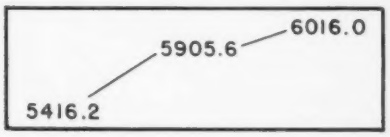
## RELATIVE WHOLESALE PRICES OF ELECTRICAL MATERIAL

| | Latest Month | Previous Month | Year Ago |
|---|---|---|---|
| Wire and cable | 128.9 | 129.1 | 142.4 |
| Watt-hour meters | 120.9 | 120.9 | 120.9 |
| 225-hp motors | 201.6 | 208.8 | 223.9 |
| Hydro generators | 185.5 | 185.5 | 198.5 |
| Steam generators | 203.5 | 203.5 | 203.5 |
| 15-kva transformers | 133.0 | 133.0 | 133.5 |

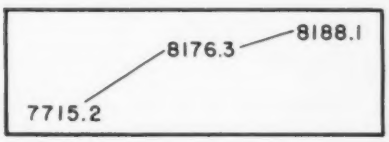
# INDICATORS

## Economy at a Glance

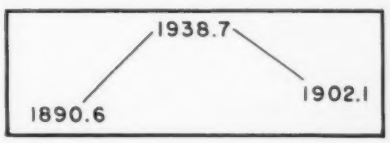
| Year Ago | Month Ago | Latest Month |
|---|---|---|



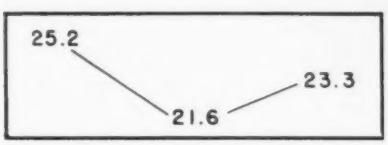

**PERSONAL INCOME** in millions—seasonally adjusted as of March 15 (An index of consumer spending potential)



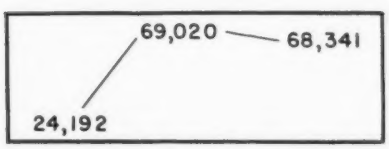

**NONFARM EMPLOYMENT** in thousands (An index of total industrial and commercial activity)




**MANUFACTURING EMPLOYMENT** in thousands (A measure of manufacturing activity)




**HOUSING STARTS** in thousands of units (Index of new residential customers)




**INDUSTRIAL BUILDING CONTRACTS** in thousands of dollars (A rough index to the dollars of electrical contracting business six months to a year ahead)

---

► Average hourly wage scales of union building trades workers advanced 0.7% during the last three months of 1960 to bring the average wage rate to $3.70 an hour, according to the U. S. Department of Labor's Bureau of Labor Statistics. Bricklayers and electricians recorded the greatest advance during the three months, both trades increasing their average scale slightly more than 4¢.

"How fast can it be delivered?"
"It's available immediately...from your wholesaler's inventory and Killark warehouse stocks in 18 cities!"

* KILLARK XALB-6 EXPLOSION-PROOF PULLING ELBOW . . . Copper-free aluminum casting, permanently rust-proof and corrosion-resistant, non-magnetic and non-sparking. Split design provides easy access to wiring; ribbed for greater strength. U.L. and C.S.A. approved. Carried in stock for fast delivery, a typical example of Killark's ability to supply all your needs —large and small—for both hazardous and non-hazardous installations.

Killark distributors can usually deliver all electrical fittings and fixture requirements from inventory. If not, your needs from the more than 7,500 items in the Killark line can be obtained *at once* from a convenient Killark warehouse. There are eighteen of these dependable supply sources located throughout the United States and Canada.

*Write for the Killark catalogs.*

Killark ELECTRIC MANUFACTURING COMPANY

Vandeventer and Easton Aves. • St. Louis 13, Mo.

*In Canada: Killark Electric of Canada, Ltd., 421 Islington Ave. South, Toronto 18, Ont.*

# Estimator's Guide

*Prices shown are for new construction cost in place. Quotations furnished by LeRoy Construction Service*

**The figures in this guide, furnished by LeRoy Construction Service, will be kept up to date and published periodically. This guide is for your use. Will you please let the editor know if there are other figures or ideas which would make this section more valuable to you?**

## *Residential Wiring*

| | |
|---|---|
| **PER OUTLET, 120 V—2 WIRE** | |
| Knob & tube | Each 7.50 |
| Nonmetallic cable | Each 7.00 |
| Armored cable (BXL) | Each 16.00 |
| Armored Cable (BX) | Each 7.50 |
| Flexible metallic conduit | Each 14.00 |
| EMT | Each 18.00 |
| Conduit rigid | Each 23.00 |
| **PER OUTLET, 230 v—3 Wire (RANGE—OVEN—WALL HEATER)** | |
| Nonmetallic cable (Romex) | Each 14.00 |
| Flex conduit (Greenfield) | Each 22.00 |
| EMT | Each 23.00 |
| **SERVICE & PANEL** | |
| Light panel & service | |
| 50 amp lugs 120/240 v—3 wire | |
| 4 1 pole circuit, 15 amp fused | 70.00 |
| Light panel & service | |
| 100 amp ACB 120/240 v—3 wire | |
| 4 1 pole circuit, 15 amp | |
| 2 2 pole circuit, 20 to 50 amp | 150.00 |
| Light panel & service | |
| 100 amp—ACB 120/240 v | |
| 6 1 pole circuit, 15 amp | |
| 3 2 pole circuit, 20 to 50 amp | 165.00 |
| Light panel & service | |
| 100 amp—ACB 120/208 v, 3 phase, 4 wire | |
| 8 1 pole circuit, 15 amp | |
| 2 2 pole circuit, 20 to 50 amp | |
| 2 3 pole circuit, 15 to 30 amp | 225.00 |
| (Required for air conditioning system) | |
| **INSTALL LIGHT FIXTURES (Fixtures Purchased on Allowance)** | |
| Incandescent | Each 4.00 |
| Fluorescent | Each 5.00 |
| Yard light | Each 5.00 |
| Bathroom exhaust fan | Each 50.00 |
| Garden pedestal light fixture | Each 40.00 |

## *Commercial Wiring—Conduit*

| **FLEXIBLE METALLIC** | **Per C** |
|---|---|
| ½" | 32.50-36.00 |
| ¾" | 37.50-43.50 |
| 1" | 63.00-69.00 |
| **RIGID GALVANIZED** | |
| ½" | 49.00- 54.00 |
| ¾" | 62.00- 68.00 |
| 1" | 79.50- 87.00 |
| 1¼" | 103.00-115.00 |
| 1½" | 121.50-132.00 |
| 2" | 160.00-175.00 |
| 2½" | 229.00-252.00 |
| 3" | 298.50-325.00 |
| 3½" | 365.50-401.00 |
| 4" | 417.50-456.00 |
| 5" | 624.50-685.00 |

## *Commercial Wiring—EMT*

| | **Per C** |
|---|---|
| ½" | 34.50- 38.00 |
| ¾" | 43.50- 48.00 |
| 1" | 58.00- 64.00 |
| 1½" | 83.00- 90.00 |
| 1¼" | 70.50- 76.00 |
| 2" | 103.00-112.00 |

## *Commercial Wiring—RHW*

**WIRE 600 V—75°**

| | **Per M** |
|---|---|
| 750 mcm, stranded | 2,011.00-2,090.00 |
| 700 mcm, stranded | 1,867.00-1,940.00 |
| 600 mcm, stranded | 1,675.00-1,742.00 |
| 500 mcm, stranded | 1,401.00-1,457.00 |
| 400 mcm, stranded | 1,140.00-1,185.00 |
| 300 mcm, stranded | 923.00- 960.00 |
| 250 mcm, stranded | 830.00- 860.00 |
| No. 4/0, stranded | 690.00- 717.00 |
| No. 3/0, stranded | 567.00- 589.00 |
| No. 2/0, stranded | 451.00- 965.00 |
| No. 1/0, stranded | 378.50- 393.00 |
| No. 1, stranded | 322.50- 335.00 |
| No. 2, stranded | 240.00- 249.00 |
| No. 4, stranded | 182.50- 190.00 |
| No. 6, stranded | 137.00- 142.00 |
| No. 8, stranded | 106.50- 110.00 |
| No. 10, stranded | 80.50- 83.00 |
| No. 12, stranded | 66.00- 68.00 |
| No. 14, stranded | 57.00- 59.00 |
| No. 8, solid | 99.00- 102.00 |
| No. 10, solid | 75.00- 78.00 |
| No. 12, solid | 61.00- 63.00 |
| No. 14, solid | 52.50- 54.00 |

## *Commercial Wiring—TW*

**WIRE 600 V—75°**

| | **Per M** |
|---|---|
| 750 mcm, stranded | 1,850.00-1,924.00 |
| 600 mcm, stranded | 1,537.00-1,598.00 |
| 500 mcm, stranded | 1,300.00-1,350.00 |
| 400 mcm, stranded | 1,017.00-1,057.00 |
| 300 mcm, stranded | 850.00- 882.00 |
| 250 mcm, stranded | 750.00- 780.00 |
| No. 4/0, stranded | 635.50- 660.00 |
| No. 3/0, stranded | 543.00- 564.00 |
| No. 2/0, stranded | 432.50- 449.00 |
| No. 1/0, stranded | 356.50- 370.00 |
| No. 1, stranded | 306.00- 318.00 |
| No. 2, stranded | 227.00- 236.00 |
| No. 4, stranded | 173.00- 179.00 |
| No. 6, stranded | 129.50- 134.00 |
| No. 8, stranded | 95.00- 98.00 |
| No. 10, stranded | 73.00- 75.00 |
| No. 12, stranded | 59.50- 61.00 |
| No. 14, stranded | 51.50- 53.00 |
| No. 8, solid | 87.00- 90.00 |
| No. 10, solid | 68.00- 70.00 |
| No. 12, solid | 55.00- 57.00 |
| No. 14, solid | 47.50- 49.00 |

## *Commercial—Outlets & Connections*

**Conduit and wire not included**

| | **Each** |
|---|---|
| Light fixture outlet | |
| Recess | 8.00 |
| Surface | 7.00 |
| WP | 8.00 |
| Duplex outlet | |
| 15 amp | 9.00 |
| 15 amp WP | 10.00 |
| Clock outlet | 9.00 |
| Floor outlet, flush | 17.00 |
| Floor outlet, pedestal type | 23.00 |
| Outlet, 240 v, 3 wire, 1 phase, 30 to 50 amp | 13.00 |
| Outlet, 240 v, 4 wire, 3 phase, 30 to 50 amp | 16.00 |
| Switch, single pole | 9.00 |
| Switch, double pole | 10.00 |
| Switch, 3 way | 10.00 |
| Switch, single pole w/pilot | 12.00 |
| Switch, momentary contact | 10.00 |

## *Motor Outlet & Connection*

| **GREENFIELD FLEXIBLE CONDUIT** | **Each** |
|---|---|
| Fractional hp, 120 v, 1 phase | 11.00 |
| Fractional to 3 hp, 240 v, 3 phase | 13.00 |
| 5 to 10 hp, 240 v, 3 phase | 14.50 |
| 15 to 25 hp, 240 v, 3 phase | 18.00 |
| 30 to 50 hp., 240 v, 3 phase | 26.50 |
| 60 to 100 hp, 480 v, 3 phase | 35.00 |
| For Sealtite add 25% | |
| For explosionproof add 50% | |

## *Power & Control Equipment*

| **MOTOR DISC. SWITCH TYPE C NONFUSIBLE STD. DUTY 250 V** | **Each** |
|---|---|
| 30 amp, 2 pole, 240 v | 19.00 |
| 30 amp, 3 pole, 240 v | 21.50 |
| 60 amp, 3 pole, 240 v | 34.00 |
| 100 amp, 3 pole, 240 v | 52.00 |
| 200 amp, 3 pole, 240 v | 84.50 |
| 400 amp, 3 pole, 240 v | 178.00 |
| 600 amp, 3 pole, 240 v | 280.00 |
| 30 amp, 3 pole, 575 v | 22.00 |
| 60 amp, 3 pole, 575 v | 36.00 |
| 100 amp, 3 pole, 575 v | 54.00 |
| 200 amp, 3 pole, 575 v | 88.00 |
| 400 amp, 3 pole, 575 v | 184.00 |
| 600 amp, 3 pole, 575 v | 290.00 |
| **PUSHBUTTON STATION** | |
| NEMA 1, std. duty | |
| One button | 14.50 |
| Two button | 17.00 |
| Three button | 22.50 |
| NEMA 1, heavy duty | |
| One button | 20.00 |
| Two button | 27.00 |
| Three button | 34.00 |
| NEMA 4 & 5, std. duty | |
| One button | 32.50 |
| Two button | 34.00 |
| Three button | 38.50 |
| NEMA 4 & 5, heavy duty | |
| One button | 37.50 |
| Two button | 42.50 |
| Three button | 61.00 |
| **MOTOR STARTERS—MANUAL** | |
| Size 00—1 pole, 120/208 v | 17.00 |
| Size 00—2 pole, 240/480 v | 19.00 |
| Size 0—2 pole, 240/480 v | 32.00 |
| Size 1—2 pole, 240/480 v | 37.00 |
| Size 0—3 pole, 240/480 v | 41.00 |
| Size 1—3 pole, 240/480 v | 46.00 |
| **MOTOR STARTERS—MAGNETIC RESET ONLY IN COVER** | |
| Size 0—2 pole, single phase | 47.00 |
| Size 1—2 pole, single phase | 52.00 |
| Size 1½—2 pole, single phase | 67.00 |
| Size 0—3 pole, 3 phase | 55.00 |
| Size 1—3 pole, 3 phase | 60.00 |
| Size 2—3 pole, 3 phase | 107.00 |
| Size 3—3 pole, 3 phase | 173.00 |
| Size 4—3 pole, 3 phase | 365.00 |
| **MOTOR STARTERS—MAGNETIC START, STOP, RESET IN COVER** | |
| Size 0—2 pole, single phase | 56.00 |
| Size 1—2 pole, single phase | 62.00 |
| Size 1½—2 pole, single phase | 77.00 |
| Size 0—3 pole, 3 phase | 63.00 |
| Size 2—3 pole, 3 phase | 68.00 |
| Size 2—3 pole, 3 phase | 116.00 |
| Size 3—3 pole, 3 phase | 183.00 |
| Size 4—3 pole, 3 phase | 374.00 |
| **UNDERFLOOR DUCT SYSTEM** | |
| Duct, No. 2, single run, including junction boxes and misc. ftgs., etc. | Per ft 2.90 |
| Duct No. 4, single run, including junction boxes and misc. ftgs, etc. | Per ft 3.20 |
| Pedestal underfloor duct outlet, power | Each 16.50 |
| Pedestal underfloor duct outlet, telephone | Each 14.00 |

**These prices are based on current labor rates in San Francisco. To modify for your area the following multipliers should be applied to the labor portion (your estimate) of the above figures.**

| | |
|---|---|
| Using San Francisco as | 1.00 |
| Los Angeles | 1.06 |
| San Diego | 1.05 |
| Oregon | 0.90 |
| Western Washington | 0.90 |
| Eastern Washington | 0.89 |
| Idaho | 0.82 |
| Utah | 0.85 |
| Nevada | 1.02 |
| Arizona | 0.96 |
| New Mexico | 0.86 |
| Colorado | 0.89 |
| Wyoming | 0.84 |
| Montana | 0.81 |

# Now, a second mill helps meet contractor demand for CIRTUBE® EMT

It took contractors a short two and a half years to catch up with the output of the first CIRTUBE EMT mill. Now, a second mill, just recently put into operation, helps meet expanding contractor needs.

Reason for CIRTUBE's quick success? Consistent high quality—from tube to tube, bundle to bundle, month to month—the same easy fishing and bendability, the same good looks. That ...and fast, friendly Circle service.

If you're not yet a CIRTUBE EMT user, be sure to try it on your next job. You...and your men ...will like working with it.

**CIRCLE WIRE & CABLE CORP.**

SUBSIDIARY OF **CERRO CORPORATION**

**PLANTS:** Maspeth and Hicksville, N. Y. **SALES OFFICES & WAREHOUSES:** In all principal cities.
Rubber Covered Wires & Cables • Varnished Cambric Cables • Plastic Insulated Cables • Neoprene Sheathed Cables • "CIRTUBE" EMT

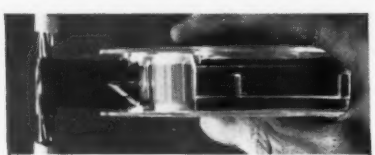
CIRTUBE EMT *Ask for it!*

# Now! Tape...and tear...with one hand!

**THIS BRAND-NEW DISPENSER** makes handling plastic electrical tape a revelation! Far safer, too, because the cutter is permanently shielded . . . can't snag hands or clothes.

From beginning to end, you'll save time and trouble with J-M *Dutch Brand* Plastic Electrical Tape in this great new dispenser. And you'll like *all ten* of the big advantages shown on the right.

But, see for yourself! Get all the facts on Dutch Brand® Plastic Electrical Tape in the handy new dispenser from your J-M Dutch Brand Distributor. Or write to Dutch Brand Division, Johns-Manville, Box 14, New York 16, N. Y. In Canada: Port Credit, Ont. Cable: Johnmanvil.



**TEN IMPORTANT ADVANTAGES!**

1. *Permanently shielded cutter!* 2. *No moving parts to snag hands, clothes!* 3. *Can't dull or clog!* 4. *"Tape-and-tear" with one hand!* 5. *Special "grip-strip" for faster starting!* 6. *Full 66' of finest plastic electrical tape made!* 7. *Preloaded . . . ready to go!* 8. *Protects tape against dirt, grease!* 9. *Big center hole for easy handling!* 10. COSTS NO MORE THAN TAPE ALONE!

JOHNS-MANVILLE
DUTCH BRAND ELECTRICAL TAPE

JOHNS-MANVILLE JM PRODUCTS

# INDEX TO ADVERTISERS AND WESTERN SALES OFFICES

## April 1961


**Allis-Chalmers Mfg. Co. 8, 9, 13**
San Francisco DOuglas 2-8384
Los Angeles MAdison 6-2231
Phoenix CRestwood 4-5426
Denver CHerry 4-6556
Salt Lake City EMpire 3-1723
Portland CApitol 2-9835
Seattle MAin 4-3737
Spokane FA 7-1581
San Diego BE 2-7355

**Aluminum Co. of America 18, 19**
San Francisco YUkon 6-6484
Los Angeles HUntley 2-2684
Denver DUdley 8-1619
Spokane RIverside 7-6124
Seattle MAin 4-4040
Portland CApitol 2-9861
Boise 2-8038

**Appleton Electric Co. 101**
San Francisco JUniper 7-5201
Los Angeles RAymond 3-9551
Seattle MAin 2-5740

**Bell Electric Co. 110**
Downey, Calif.: J. H. Kay TOpaz 2-6818
San Francisco: Garrison & Co. ATwater 2-8220
Denver: A. J. Nelson Co.
Portland: Pacific Elec. Sales BElmont 5-4137
Phoenix: Fissell Kossnar Sales WH 6-3513

**Blackburn Corp., Jasper 20**
San Francisco: Donald E. Ingalls JUniper 6-0332
Los Angeles: Robert M. Schow HUbbard 3-7931
Vancouver, Wn.: Wm. A. Horning OXford 4-4475
Phoenix: W. C. Osborn WIndsor 3-1815
Denver: Sales Engineers Co. AComa 2-4893
Salt Lake City:
James D. Stephens Co. EMpire 3-7402
Albuquerque: Ralph B. Black AMherst 5-0144

**Bullard Co., E. D. 7**
Sausalito (San Francisco) EXbrook 7-0780 or ED 2-0410
Los Angeles PLeasant 3-1171

**Bull Dog Electric Products Div. 40**
(See listing under I-T-E Circuit Breaker Co.)

**Chance Co., A. B. 47**
Burlingame, Calif. OXford 7-1545
Seattle MAin 3-6886
Portland CApitol 8-3866
Los Angeles LUdlow 2-6453
Bountiful, Utah AXtel 5-7144
Anchorage, Alaska: J. P. Bagoy BR 4-1884
Honolulu, Hawaii: Hugh Bargion

**Charter Industrial Eng. Co. 54**
San Francisco YUkon 1-0427

**Christy Concrete Products Inc. 106**
Emeryville, Calif. OLympic 2-7410

**Circle Wire & Cable Co. 113**
Sub. of Cerro de Pasco Corp.
San Francisco: Brill Electric Sales SUtter 1-7547
Los Angeles: Elkins Electric Agency ANgelus 8-3385
Seattle: Electric Agencies MAin 3-2360

**Classified 109**

**Condon Co., Earl E. 54**
Los Angeles DUnkirk 1-3951

**Copperweld Steel Co. 14, 15**
San Francisco DOuglas 2-6979
Bellevue, Wash. GLencourt 4-1233

**Davey Tree Surgery Co. 66**
San Francisco SUtter 1-3377
Los Angeles MAdison 3-1929

**Delta Star Electric Div.**
(See H. K. Porter Co. Inc.)

**Eagle Electric Mfg. Co., Inc. 108**
San Francisco: Brill Electric Sales MArket 6-0456
Los Angeles: Robt. B. Focht MAdison 6-7736
Portland: M. Levin CApitol 2-9591

**Electrical Tubular Products 46**
Los Angeles: Weingart & Lustig ADams 3-4111
Portland: Pacific Electric Sales BElmont 5-4137

**Electro Compound Co. 106**
Los Angeles: W. E. Starr Co. AN 9-0371
Portland: Oregon Mfg. Agents CApitol 6-3971
Denver: Strong & Humphrey SH 4-1351
San Francisco:
Electrical Sales Co. EXbrook 7-2087

**Enjay Chemical Co., Div., Humble Oil & Refining Co. 52**

**Erico Products, Inc. 51**
Los Angeles LUdlow 1-9922
San Francisco: Pacific Utilities Supply YUkon 6-1625
Seattle: Cascade Distributors MAin 4-5625
Spokane: Cascade Distributors HUdson 7-8114
Denver: Landes, Zachary & Peterson SHerman 4-1311

**Everstick Anchor Co. 54**
Joslyn Pacific Co. in following cities:
Los Angeles LUdlow 7-4251
San Francisco UNderhill 1-7313
Seattle MAin 3-1957
Portland CApitol 3-5127

**Fanner Mfg. Co. 48**
San Francisco: Sold Through Line Material Industries PLaza 5-8600
Los Angeles RAymond 3-6251 and OXford 5-2260
Phoenix ALpine 4-8471
Denver: Slaybaugh & Thompson AComa 2-5826
Portland: A. L. Polich, Inc. CApitol 3-6241
Seattle: A. L. Polich, Inc. WE 2-9011
Albuquerque: Smith Sales Co. AXtel 9-8024

**Fisher-Pierce Co., Inc. 69, 96, 97**
San Francisco: Maydwell & Hartzell ATwater 8-6900
Los Angeles: Maydwell & Hartzell MAdison 8-7245
San Diego: Maydwell & Hartzell JUniper 2-6749
Phoenix: Maydwell & Hartzell BRidge 5-7644
Seattle: Oscar Hogenson MAin 2-0737
Portland: J. A. Tudor Asso. BElmont 2-1188
Denver: Hamilton Assoc. CHerry 4-2901

**Fullman Mfg. Co. 109**
San Francisco: L. F. Church UNderhill 1-2840
Los Angeles:
Payne & Sloan, Inc. MAdison 4-7317
Denver: Harvey Olmstead TAbor 5-6264
Bellevue, Wn.: R. C. English GL 4-0566
Portland: Nelson English CApitol 3-9814

**G & W Electric Specialty Co. 94**
San Francisco:
C. E. Ingalls & Sons GArfield 1-2916
Los Angeles:
R. E. Cunningham & Son MAdison 8-1105
Seattle: W. R. Hendrey Co. MAdison 3-3968
Salt Lake City:
Riter Engineering Co. EMpire 3-7933
Denver: H. C. Guire Co. SPruce 7-2864
Albuquerque: Frank W. Gorman CHapel 7-1596

**Gedney Electric Co. 3rd Cover**
San Francisco: Baxter Co. MArket 1-8636
Los Angeles: Rutkin Electric Sales MAdison 3-1224
Seattle: J. H. Stumph Co. MU 2-5232
Portland: Georg Roth PR 5-4747
El Paso: H & C Elec Sales
Salt Lake City: George Darger Co. ELgin 5-2873

**General Electric Co. Apparatus Div. 26, 27**
San Francisco DOuglas 2-3740
Los Angeles MAdison 5-7381
Phoenix ALpine 8-7724
Denver KEystone 4-7171
Boise 4-3021
Salt Lake City EMpire 4-1891
Portland ATwater 8-0281
Seattle MAin 4-8300

**General Electric Co., Cleveland, Lamp Div. 84**
Oakland LOckhaven 9-3422
Los Angeles RAymond 3-2541
Denver AMhurst 6-0285
Seattle MAin 2-8081
Portland CApitol 3-2101

**General Electric Co. Insulator Div. 17**
Burlingame, Calif. DIamond 4-5757
Portland BElmont 4-0233
Denver GEnesee 3-5511

**Holan Corp. 98**
Los Angeles MAdison 4-8555
Phoenix APplegate 8-6256

**Indiana Steel & Wire Co., Inc. 53**
(Distributed by Graybar, all branches)
San Francisco MArket 1-5131
Los Angeles ANgelus 3-7282
Portland ATlantic 8-5661
Seattle MUtual 2-0123
Denver TAbor 5-7111
Salt Lake City ELgin 9-8771

**I-T-E Circuit Breaker Co.**
South San Francisco PLaza 6-8660
Los Angeles MAdison 2-7134
Denver AMherst 6-1404
Phoenix AMherst 4-2166
Portland CApitol 6-4754
Seattle MAin 3-0504
Salt Lake City: Riter Eng. Co. INgersol 7-9449
Butte: McDonough, R. E. BUtte 2-5447
El Paso: R. L. Brewer Co., Inc. KEystone 2-7651

**BullDog Electric Products Div. 40**
Oakland:
Safety Switchboard Co. LOckhaven 9-7001
Los Angeles: BUlldog Elec. Products of L. A. ANgelus 9-8101
Portland: Coast Elec. & Mfg. Co. ATlantic 8-5373
Denver: Young Elec. & Mfg. Co. AComa 2-4841

**Johns-Manville Corp. 21**
San Francisco DOuglas 2-4353
Los Angeles DUnkirk 5-0595
Seattle MElrose 3-4300
Denver KEystone 4-6378
Salt Lake City EMpire 4-8446
Portland CApitol 3-8260

**Johns-Manville Dutch Brand Div. 114**
San Francisco DOuglas 2-4353
Los Angeles DUnkirk 5-0595
Seattle MElrose 3-4300
Denver KEystone 4-6378
Salt Lake City EMpire 4-8446
Portland CApitol 3-8260

**Kearney Corp., James R. 25**
Maydwell & Hartzell, Inc., in following cities:
San Francisco ATwater 8-6900
Los Angeles MAdison 8-7245
Seattle MAin 4-2368
Portland CApitol 8-4173
Spokane MAdison 4-3285
Phoenix ALpine 2-5858
San Diego CYpress 6-2245
Salt Lake City: Conely Engineering Co. EMpire 3-5013
Golden, Colo.: Robert C. Smith CRestview 9-5279

**Killark Electric Mfg. Co. 111**
San Francisco: F. M. Nicholas YUkon 2-1964
Los Angeles: Kenneth Anderson Co. ANgelus 8-6771
Seattle: Northwestern Agencies, Inc. MAin 3-8882
Denver: Kenneth B. Schumann Co. AComa 2-8913
Phoenix: Kenneth Anderson Co. AMherst 5-2863

**Klein & Sons, Mathias 67**
Glendale, Calif. CItrus 3-3523
Redwood City, Calif. EMerson 9-2274

**Kuhlman Electric Co. 2nd Cover**
Maydwell & Hartzell, Inc., in following cities:
San Francisco ATwater 8-6900
Los Angeles MAdison 8-7245
Seattle MAin 4-2368
Portland CApitol 8-4173
Phoenix BRidge 5-7644
Spokane MAdison 4-3285
San Diego JU 2-6749
Denver: Sales Engineers AComa 2-4893
Salt Lake City: Sales Engineers HUnter 5-3547

**LeRoy Construction Services 66, 105**
San Francisco UNderhill 1-2483

**Leviton Mfg. Co. 107**
San Francisco UNderhill 3-2600
Los Angeles MAdison 5-1546
Denver: Roy J. O'Donnell PE 3-5541
Seattle: W. W. Wheat & Sons MA 4-6222

# Index to Advertisers

(Continued from Page 115)


**Line Material Industries** 3
San Francisco PLaza 5-8600
Los Angeles RAymond 3-6251
Portland CApitol 2-1981
Seattle ATwater 3-6368
Spokane KEystone 5-2461
Salt Lake City ELgin 5-6257
Phoenix: J. E. Redmond Supply ALpine 4-8471
Boise Phone: 2-5706
Butte Phone: 8340
Denver FL 5-1689 and 1680
Sacramento, Calif. GI 2-6264
Anchorage (Spenard) Alaska FA 2-2649

**Marcus Transformer Co. Inc.** 11
San Francisco: E. B. Cook Co. UNderhill 1-2621
Los Angeles: Pacific Industries WEbster 3-0335
Seattle: N. R. Schultz Co. SEneca 6-6369
Denver: R & M Sales Co. SPruce 7-2515
Albuquerque: McGillan Sales Co. ALbuquerque 5-5239

**Mason Co., L. E.** 93
San Francisco: G. M. Howard & Assoc. MArket 1-6759
Los Angeles: John M. Fincke Co. CApitol 5-4226
Portland: Pacific Electric Sales Co. BElmont 5-4137
Denver: Harry F. Ream Sales Agency CHerry 4-0558

**Ohio Brass Co.** 39
San Francisco SUtter 1-5060
Los Angeles MAdison 4-8555
Seattle MAin 2-3842
Denver SKyline 6-7722

**Olin Conductors** 28
Garland-Affolter Eng. Co. in following cities:
San Francisco EXbrook 7-1800
Los Angeles MAdison 4-1864
Portland CApitol 3-7349
Seattle MUtual 2-4950
Denver: Hamilton Associates CHerry 4-1505
Phoenix: R. E. Coulson Co. WIndsor 3-8935

**Pacific Gas and Electric Co.** 16
San Francisco SUtter 1-4211

**Paragon Electric Co.** 109
Los Angeles AN 8-3895
San Francisco: McCune-Western, Inc. YU 6-1006
Denver: Roy J. O'Donnell Co. KE 4-0179
Seattle: John B. Merifield Co., Inc. MA 3-7850

**Pennsylvania Transformer Div.** 29
San Francisco: George E. Honn Co. SUtter 1-7352
Los Angeles: John G. Corrin MAdison 2-0830
Seattle: Fred W. Carlson ATwater 4-4630
Phoenix: Roy E. Coulson WIndsor 3-8935
Denver: Peterson Co. DExter 3-5434
Salt Lake City: Clarence W. Silver ELgin 5-5378
Portland; Fred W. Carlson & Associates CApitol 8-3798
Boise, Ida.: Clarence W. Silver Co. 2-6947
Albuquerque: Williamson Sales Co. ALpine 6-6617

**Peterson Engineering Co.** 68
(Contact factory for nearest dealer)
Santa Clara, Calif. AX 6-7712

**Phelps Dodge Copper Products Corp.** 4, 5
San Francisco OXford 7-7333
Los Angeles RAymond 3-1311 and PArkview 1-1191
Seattle GLencourt 4-5026
Denver CHerry 4-9291 and CHerry 4-9292
Portland CApitol 6-6117

**Pfaff & Kendall** 59
San Jose, Calif. ALpine 2-7186
San Francisco: Wrathall & Krusi, Inc. EXbrook 7-3593
Los Angeles: C. A. Peterson Co. CApitol 5-2231
San Diego: John C. Henberger Co. BRowning 4-6283
Phoenix: Wm. Benndorf Co. CRestwood 7-1662
Oswego, Ore.: Henry G. Lehl NEptune 6-4210

**H. K. Porter Co., Inc., Delta Star Elec. Div.** 4th Cover
San Carlos LYtell 1-4461
Albuquerque: Ralph B. Black ALpine 5-9625
Denver: W. E. Young Co. AComa 2-4841
Los Angeles MAdison 6-5651
Phoenix: Daley Elec. Sales Co. Inc. ALpine 4-4176
Salt Lake City: Stevens Sales Co. INgersol 7-5489
San Francisco EXbrook 2-2588
Seattle MAin 4-7066
Tucson: Daley Elec. Sales Co. Inc. MAin 4-6943

**Precision Multiple Controls** 64, 65
San Francisco: Wrathall & Krusi EXbrook 7-3593
Los Angeles: Industrial Engineering & Equip. Corp. DUnkirk 1-1281
Denver: Jim Dawson Co. ALpine 5-7194
Salt Lake City: Leonard M. Slusser ELgin 5-2322
Vancouver, Wn.: Bill Horning Sales OXford 4-4475

**Republic Steel Corp.** 95
San Francisco GArfield 1-0977
Los Angeles MAdison 4-5144
Portland: Shaffer & Nelson Inc. BElmont 4-7437
Seattle: Shaffer & Nelson Inc. MUtual 2-0186
Spokane: Shaffer & Nelson Inc. FAirfax 7-9528
Denver: C. D. Belt Co. SKyline 6-9421

**Reynolds Metals Co.** 12
San Francisco MIssion 7-2990
Los Angeles DUnkirk 1-3511
Seattle MAin 3-2503
Troutdale, Ore. MOhawk 5-8158
Salt Lake City HUnter 7-7749
Phoenix APplegate 8-3551

**Rome Cable Div. of Alcoa** 30, 87
Los Angeles HUntley 2-2475
San Francisco VAlencia 6-3580
Seattle MAdison 4-3017
Salt Lake City ELgin 9-8811
Denver KEystone 4-0533

**Royal Electric Corp.** 91
Los Angeles: Eckert-Lloyd Co. RIchmond 7-9655
San Francisco: Eckert-Lloyd Co. HEmlock 1-5792
Seattle: Northwestern Agencies MAin 3-8882
Portland: Northwestern Agencies CApitol 7-0434
Phoenix: Wm. Benndorf CRestwood 7-1662
Denver: Strong & Humphrey SH 4-1351

**Sangamo Electric Co.** 55
San Francisco: L. A. Nott HEmlock 1-4738
Los Angeles: (Factory Sales) DUnkirk 7-2336
(Time Switches) ANgelus 8-6771
Seattle: T. R. Wood MAin 3-8204
Denver: Mt. States Machinery CHerry 4-7421
Phoenix: J. E. Redmond Co. ALpine 4-8471
Portland: R. L. Schoenberger CApitol 3-8742
Butte: R. E. McDonough Butte 2-5447
Tucson AXtel 8-4801
Albuquerque: Gorman Engineering CHapel 7-1596
El Paso: Gorman Engineering KEystone 2-3449
Anchorage, Alaska: John P. Bagoy BR 4-1884

**Southern California Edison Co.** 24
Los Angeles MAdison 4-7111

**Southern States Equipment Corp.** 60, 61
Seattle: Jos. C. Platt MAin 3-6141
Salt Lake City: T. R. Van Wagoner Co. HUnter 6-7251
Denver: R. T. Lewis Co. EAst 2-1082
Los Angeles: W. E. Kirk Co. MAdison 4-3651
Lake Grove, Ore.: C. F. Selby NEptune 6-1486
Oakland: John H. Ormond TWinoaks 3-3235

**Square D Co.** 104, 105
Los Angeles CApitol 1-1171
San Francisco JUniper 7-4590
Seattle EAst 3-1474
Portland BElmont 4-8488
Denver KEystone 4-6234
Salt Lake City DAvis 2-5859
Phoenix ALpine 8-6448
El Paso KEystone 3-0544
Spokane FAirfax 8-3690
San Diego BElmont 3-7621
Fresno AMherst 8-6268

**Standard Oil Co. of Calif.** 45
San Francisco SUtter 1-7700
Los Angeles MAdison 4-2711
Portland CApitol 3-4161
Seattle MAin 3-6310
Salt Lake City DAvis 2-5831

**Subox, Inc.** 6
San Francisco: Wrathall & Krusi EXbrook 7-3593
Los Angeles: R. E. Cunningham & Son MAdison 8-1105
Portland: Wm. J. Cottrell & Assoc. CApitol 7-6191
Seattle: Fred H. Carlson Co. ATwater 4-4630
Denver: Ambler Co. TAbor 5-8885

**Thomas & Betts Co.** 109
San Francisco VAlencia 6-5300
Oakland (Utility Div.): C. E. Ingalls & Sons OLympic 8-5622
Los Angeles ANgelus 8-3191
Seattle: Frank Strohecker MAin 3-0357

**Tri-State Supply Corp.** 94
Los Angeles MAdison 8-2354
San Francisco EXbrook 2-8890
Seattle MAin 2-4161

**Truck Equipment Co.** 58
Los Angeles: Calavar Corp. RIchmond 8-6292
Oakland: Dailey Body Co. KEllog 4-1423
Portland: Schetky Equipment Corp. BEaverton 4-5344
Spokane: Leland Trailer & Equip. Co. KEystone 4-0591
Salt Lake City: W. H. Pingree Co. EMpire 3-6731
San Francisco: Caesar Baldassari EXbrook 7-1303
San Francisco: FWD Pacific Co. GArfield 1-4971
Seattle: Robblee Utility Equipment Co. MAin 4-1412
Denver: Rocky Mountain Export Co. MAin 3-7185

**Victor Specialties, Inc.** 106
San Francisco: Stanley Sales Corp. UNderhill 3-8900
Los Angeles: Hayjax Co. MAdison 8-5256
Phoenix: George W. Hill WH 6-1657
Salt Lake City: John E. Elggren AXtel 5-0472
Denver: Bacon's Elec'l Equip. CH 4-6563

**Wagner Electric Corp.** 22, 23
South San Francisco PLaza 6-0520
El Segundo, Calif. ORegon 8-7671
Portland CApitol 7-3654
Salt Lake City EMpire 3-5013
Denver CHerry 4-7421
Seattle MAin 2-2342

**Weld Rite Co.** 10
Oakland ANdover 1-3341
Los Angeles MAdison 4-9338

**Western Insulated Wire Co.** 44
Los Angeles LUdlow 7-7103
San Francisco: Electrorep, Inc. MArket 6-0225
Seattle: J. H. Stumph Co. MUtual 2-5232
Albuquerque: John Carder CHapel 2-3581
Salt Lake City: T. R. Van Wagoner HUnter 6-7251
Portland: George M. Roth CApitol 7-5654

**Westinghouse Electric Corp.** 33, 34, 35, 36, 82, 83
San Francisco EXbrook 2-5353
Los Angeles MAdison 6-3881
Denver KEystone 4-8121
Phoenix ALpine 8-8621
Salt Lake City ELgin 5-3413
Seattle MAin 2-0808
Portland ATlantic 8-6311
Spokane FAirfax 8-3371



Send me the NEWEST Edition of the ELECTRICAL WEST BUYERS GUIDE & MANUFACTURERS DIRECTORY as a FREE BONUS for a 3-year subscription to ELECTRICAL WEST at the rock-bottom rate of only $6.00.

Payment enclosed Bill me

Name Title

Address: Home

Business

City Zone State

Company

Type of Business

4-61

Malleable Iron Liquid-Tite Connectors

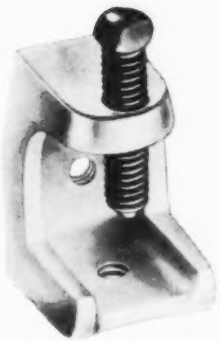
# QUALITY MALLEABLE IRON FITTINGS ARE AVAILABLE!

## GEDNEY'S

*Complete Line is Precision-Made of Unbreakable Malleable Iron . . .*

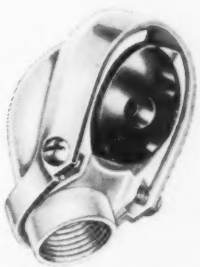
- *Unmatched for Toughness*
- *Impervious to Corrosion*

**GEDNEY FITTINGS FIT**

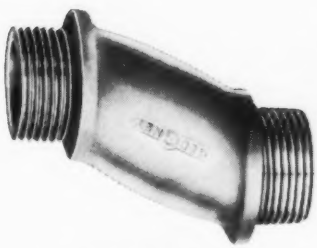


M.I. Beam Clamps

M.I. 90° Corner Adapters and Corner Elbows



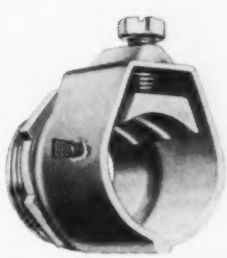
M.I. Entrance Caps



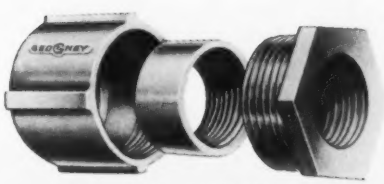
M.I. Offset Connectors and Offset Nipples

M.I. Insulated Bushings

M.I. Conduit Bodies



M.I. Armored Cable & Non Metallic Connectors



M.I. 3 Piece Conduit Couplings

# CRITICAL EVALUATIONS

The new Delta-Star series of utility transformers has measured up on every count—inside and out—under the most critical evaluations. This superior performance is no surprise. Delta-Star transformers are Western-designed, Western-built...to meet or exceed Western utility standards for low-loss, reliable operation. Ask for rating-by-rating reports that show why more and more utilities BUY DELTA-STAR!

**DELTA-STAR ELECTRIC DIVISION**

**PORTER H. K. PORTER COMPANY, INC.**

*Delta-Star Electric Division, 1030 Washington Street, San Carlos, California, or from—*
*Delta-Star sales offices at Albuquerque, Denver, Los Angeles, Phoenix, Salt Lake City, San Francisco, Seattle, Tucson.*

**PORTER SERVES INDUSTRY** with steel, rubber and friction products, asbestos textiles, high voltage electrical equipment, electrical wire and cable, wiring systems, motors, fans, blowers, specialty alloys, paints, refractories, tools, forgings and pipe fittings, roll formings and stampings, wire rope and strand.